

IRS RESEARCH SAFETY VEHICLE TO 1979 DODGE ENDER CRASH TEST REPORT—FRONTAL ALIGNED IMPACT AT 86.52 MPH CLOSING SPEED

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TEST REPORT

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<p>16. Abstract</p> <p>This report presents the results of an 86.52 mph Frontal Aligned Impact crash test between the Minicars RSV M5-11 and a production 1979 Dodge Challenger. The objective of this test was to obtain data to evaluate the crashworthiness of the Minicars RSV by providing a comparison between the occupant protection capability of the Minicars RSV and a production car in a frontal collision mode.</p> <p>For this test, two calibrated 50th percentile dummies were placed in the driver and front passenger positions in each car. The Minicars RSV occupant restraint system consisted of air bags and knee restraints. The Dodge Challenger occupant restraints consisted of a production three-point belt system with emergency locking retractors (ELR-INERTIA).</p> <p>The dummy occupants in the Minicars RSV did not exceed the injury criteria of FMVSS 208, but it appeared the right front passenger's right hand was not contained within the vehicle due to opening of the right side door. Both dummies in the Dodge Challenger injury levels for the head and chest exceeded the injury criteria of FMVSS 208.</p>			
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<u>LENGTH</u>				
in	*2.5 feet	centimeters	mm	mm
ft	30 yd	centimeters	cm	in
yd	0.9 1.6	meters	m	ft
mi		kilometers	km	yd
<u>AREA</u>				
in ²	6.5 square feet	square centimeters	cm ²	in ²
ft ²	0.09 square yards	square meters	m ²	ft ²
yd ²	0.8 square miles	square kilometers	km ²	yd ²
mi ²	2.6 acres	hectares	ha	mi ²
<u>MASS (weight)</u>				
oz	28 pounds	grams	g	oz
lb	0.45 short ton (2000 kg)	kilograms	kg	lb
		tonnes	t	
<u>VOLUME</u>				
ts	6 tablespoon	milliliters	ml	fl oz
Thsp	15 fluid ounces	milliliters	ml	pt
fl oz	30 cups	liters	l	qt
c	0.24 pints	liters	l	gal
pt	0.47 quarts	liters	l	h ³
qt	0.96 gallons	liters	l	yd ³
gal	3.8 cubic feet	cubic meters	m ³	
h ³	0.03 cubic yards	cubic meters	m ³	
yd ³	0.76			
<u>TEMPERATURE (exact)</u>				
°F	Fahrenheit temperature	Celsius temperature	°C	°F
	6/9 letter subtracting 32)			

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<u>LENGTH</u>				
in	0.04 inches	millimeters	mm	in
in	0.4 inches	centimeters	cm	in
ft	3.3 feet	meters	m	ft
yd	1.1 yards	meters	m	yd
mi	0.6 miles	kilometers	km	mi
<u>AREA</u>				
in ²	square inches	square centimeters	cm ²	in ²
yd ²	square yards	square meters	m ²	ft ²
mi ²	square miles	square kilometers	km ²	yd ²
	hectares (10,000 m ²)	hectares (10,000 m ²)	ha	
<u>MASS (weight)</u>				
oz	0.03 ounces	grams	g	oz
lb	2.2 pounds	kilograms	kg	lb
	1.1 short tons	tonnes (1000 kg)	t	
<u>VOLUME</u>				
ml	0.03 fluid ounces	milliliters	ml	fl oz
l	2.1 liters	milliliters	ml	pt
l	1.04 liters	liters	l	qt
l	0.26 cubic feet	liters	l	gal
l	36 cubic meters	liters	l	h ³
l	1.3 cubic meters	liters	l	yd ³
<u>TEMPERATURE (exact)</u>				
°C	Celsius temperature	°F (then add 32)	°F	°C

* 1 m = 3.28 (exactly). For other unit conversions and their relationships, see NBS Manual Publ. 284, Units of Weight and Measures, Price \$2.25, GPO Catalog No. C 1110 260.



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1.0 INTRODUCTION

1.1 BACKGROUND

The National Highway Traffic Safety Administration's Research Safety Vehicle (RSV) Program was initiated to develop advanced, State-of-the-Art vehicles which provide improved safety performance, efficient energy utilization, and environmental protection. This program has resulted in the design, development, and fabrication of two distinctive prototype vehicles made by two different contractors - Calspan and Minicars.

The Minicars RSV Program is currently in its fourth and final phase - Vehicle Test and Evaluation. Under this phase, a number of tests have been planned to evaluate the RSV's performance in terms of its crashworthiness, crash avoidance, ergometrics, fuel economy and emissions, etc. Many of these tests are being performed abroad under existing bilateral agreements between the United States Government and governments in Europe and Japan. However, some of the testing is being conducted in the United States.

Dynamic Science, Inc. was contracted by NHTSA to perform tests to evaluate the crashworthiness of the Minicars RSV using a production 1979 Dodge Challenger as the crash partner. The testing matrix is presented in Table 1-1.

TABLE 1-1. MINICARS RSV CRASHWORTHINESS TEST MATRIX

DSI Test Number	Test Date	Description	RSV M5-11 Speed (mph)	Challenger Speed (mph)
3108-1	9/10/80	Frontal Aligned Crash	43.26	43.26
3108-2	TBD	Rear Impact Crash	0.0	(45.00)

This report presents the results of Test 3108-1, a vehicle-to-vehicle Frontal Aligned Crash Test.

1.2 TEST OBJECTIVE

The objective of this test was to obtain data to evaluate the crashworthiness of the Minicars RSV by providing a comparison between the occupant protection capability of the Minicars RSV and a production car in a frontal collision mode as close to the RSV design speed as possible.

1.3 TEST CONDITIONS

Both vehicles were instrumented with structural accelerometers and other instrumentation to measure and record vehicle responses. Each vehicle contained calibrated, certified, Alderson Part 572 50th percentile dummies in the driver and right front passenger positions. High-speed motion pictures of the crash were recorded on 16 mm color film.

The Minicars RSV M5-11 was equipped with air bags for both the driver and right front passenger seating positions. The dummies were otherwise unrestrained. The dummies in the Dodge Challenger were restrained by the production three-point belt systems with emergency locking inertia retractors.

1.4 SUMMARY OF OCCUPANT TEST RESULTS

The front seat occupant's air bag restraint systems in the Minicars RSV inflated and deployed during impact. Both RSV occupant's head, chest, and femur injury levels did not exceed the

criteria as specified in Federal Motor Vehicle Safety Standard FMVSS 208. However, because the right door opened during the crash event, the right front passenger dummy's right hand appeared not to be contained within the outer surface of the passenger compartment, violating one of the requirements of FMVSS 208*. The right front door opened due to failure of the mounting rivets securing the lower door latching mechanism to the door structure. This subject is further discussed in Section 4.2 of this report.

The three-point belt restraint with emergency locking retractors provided for the front seat occupants in the Dodge Challenger appeared to operate satisfactorily. The HIC values and chest accelerations for the Dodge driver and right front passenger exceeded FMVSS 208 Occupant Injury Criteria. The femur injury levels were below the FMVSS criteria for both occupants.

The complete test results are presented in Section 4.0 of this report.

*The applicable FMVSS 208 standard states that: "All portions of the test device shall be contained within the outer surfaces of the vehicle passenger compartment throughout the test."

2.0 TEST METHODOLOGY

The Minicars RSV M5-11-to-Dodge Challenger frontal aligned crash test was conducted at the midrange impact site with impact occurring over the camera pit (see Figure 2-1).

The test vehicles were prepared in accordance with the requirements of the approved test plan (portions reproduced in Appendix D) and placed at opposite ends of the test track (RSV at barrier end, Dodge Challenger at rollover site end) where they were attached to the tow and guidance system. The dummies in the Dodge Challenger were positioned according to FMVSS 208 procedures. The dummies in the Minicars RSV were positioned according to published Minicars Phase IV procedures. Upon completion of the pre-test checkout of vehicles' instrumentation and the RSV air bag firing circuitry, the vehicles were towed to the specified speed and released within three feet of the designated impact point. The data from the test vehicles were transmitted to the data acquisition center via umbilical cable with telemetry backup.

2.1 DATA ACQUISITION METHODS

The overall plan for obtaining the test data is outlined in Table 2-1, which defines the test parameters, measurement method, and recording method used during the preparation and conduct of the test. Table 2-2 describes the test equipment and its function as it applies to the test parameters. All electronic data were processed in accordance with Dynamic Science, Inc. procedures and filtered according to SAE J211b.

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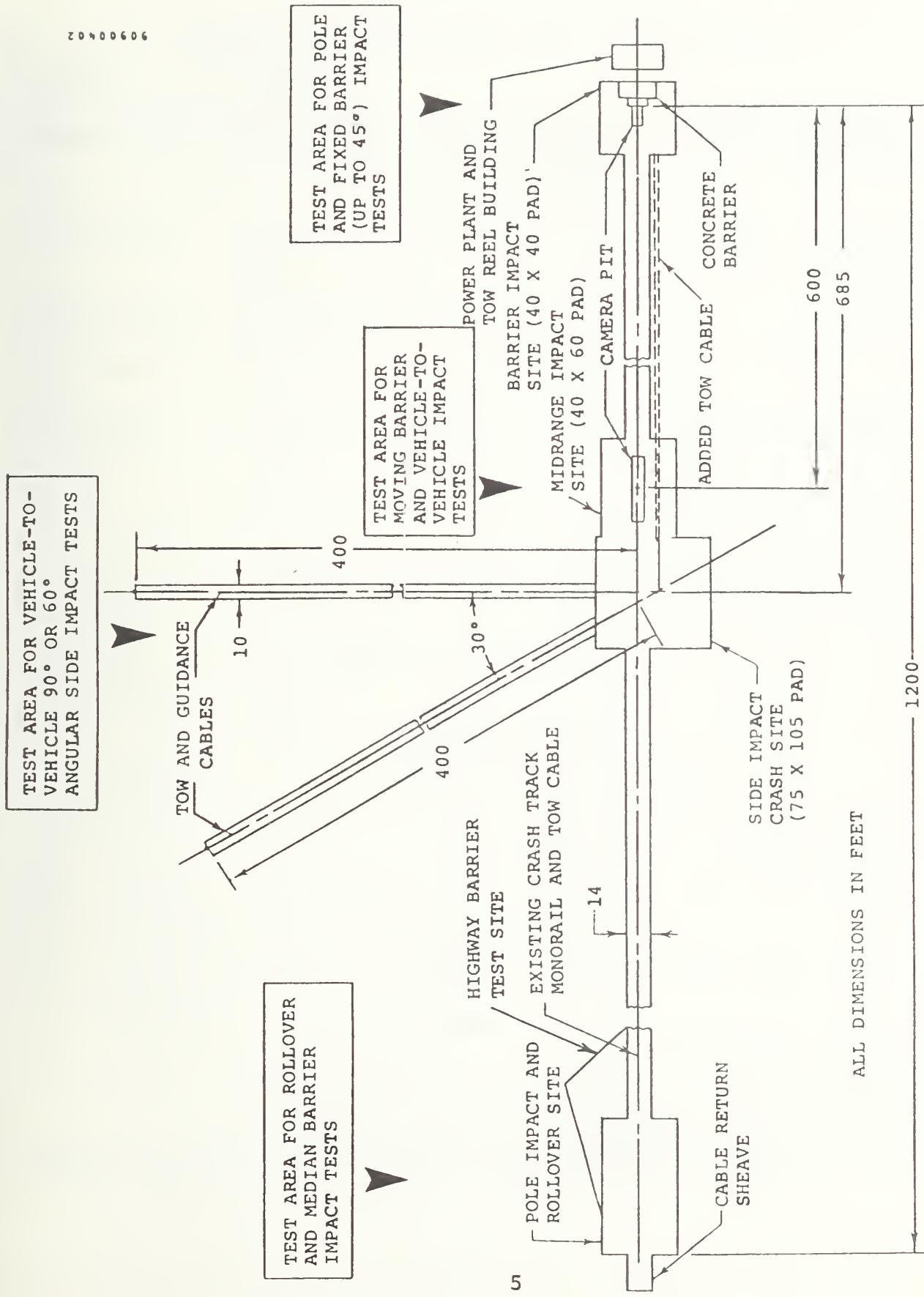


FIGURE 2-1. DYNAMIC SCIENCE IMPACT FACILITY.

TABLE 2-1. DATA REQUIREMENTS

<u>Test Parameter</u>	<u>Measurement Method</u>	<u>Magnetic Tape</u>	<u>Written Log</u>	<u>Photo-graphic Analysis</u>
Impact time	Contact switch signal impressed on millisecond time base	X		
Approach Velocity	Tow cable velocity sensor	X		
Impact Velocity	Speed trap entrance and exit signals from speed trap	X*		
Rebound Velocity	Integration of accelerometer Data	X		
Vehicle Acceleration Measurements	Accelerometers, unbound strain gage type	X		
Occupant Acceleration Measurements	Accelerometers, unbound strain gage type	X		
Vehicle Structural Deformation	Direct linear measurement			X
Vehicle Static Crush	Direct linear measurement			X
Vehicle Dynamic Crush	Film Analysis, Integration of accelerometer data	X		X
Rebound Distance	Direct linear measurement and high-speed film analysis		X	X
Occupant Compartment Intrusion	Direct linear measurement			X
Occupant Dynamic Displacement	High-speed film analysis			X
Vehicle Weight by Wheel	Direct pre-test measurement using balance scales			X
Air bag Sensor Event	Monitored switch signal	X		
Passenger Diffuser and Air bag Pressure	Pressure Transducer	X		
Steering Column Dynamic Collapse	Displacement Transducer	X		

*Velocity is also measured by electronic counter.

TABLE 2-2. TEST EQUIPMENT LIST AND FUNCTION

Item	Manufacturer	Model	Purpose
Timing Trap	Dynamic Science	None	Determine impact speed by furnishing a start and stop signal to recording oscilloscope.
Tape Switch			Records start of event.
Oscilloscope	Bell and Howell	5-134	Records timing start and stop signals from timing traps, cable drive drum rpm, and impact switch.
Speed Control	Dynamic Science	None	Precision control of cable drive drum rpm.
Beam Scales	Western	WP2000	Used to determine vehicle test weights.
High-speed Motion Picture Cameras	Photosonic Milliken Locam	16-1B DBM-5A 51-0003	Used for side, overhead, pit and on-board film coverage as required
Motion Picture Camera	Canon Scoopic		Panning and documentation.
Still Camera	Mamiya	RB67	Documentary photo coverage.
100 and 100 Hz Time Code Generators	Dynamic Science	None	Furnish timing signal for high-speed cameras and a 1-millisecond timing for velocity determination.
Calibrated Steel Rule	Starrett	48 in.	Precision measurement of velocity trap spacing.
Anthropomorphic Dummies	Anderson (GFE)	Part 572	To ballast the vehicle and to observe occupant dynamic movement.
Vehicle Engine Accelerometers	Statham	A69TC-250	Measure engine accelerations.
Vehicle Frame Accelerometers	Statham	A69TC-200	Measures vehicle acceleration.
Dummy Head & Chest (Redundant) & Pelvis Accelerometers	Endevco	2264-2000	Measure head and chest accelerations.
Dummy (Primary) Head & Chest Accelerometers	Endevco	7233C-750	Measures head and chest accelerations.
Tape Recorder	Sangamo	Sabre III	Records instrumentation signals.
Oscilloscope	Bell and Howell	5-134	Records real-time quick-look data
Signal Conditioner	Ectron	M140	Conditions instrument output signal for recording.

3.0 INSTRUMENTATION REQUIREMENTS

3.1 MINICARS RSV INSTRUMENTATION

The Minicars RSV was instrumented with structural accelerometers, passenger air bag pressure sensors, an air bag time of deployment sensor, and a string potentiometer to measure steering column collapse per Figure 3-1 and Table 3-1. In addition, contact switches were placed at the point of initial impact on the bumper to record the time of the event and to trigger the impact correlation bulbs for the high-speed cameras.

3.2 DODGE CHALLENGER INSTRUMENTATION

The Dodge Challenger was instrumented with structural accelerometers per Figure 3-2 and Table 3-2. Contact switches were also placed on the initial bumper contact point of the Challenger.

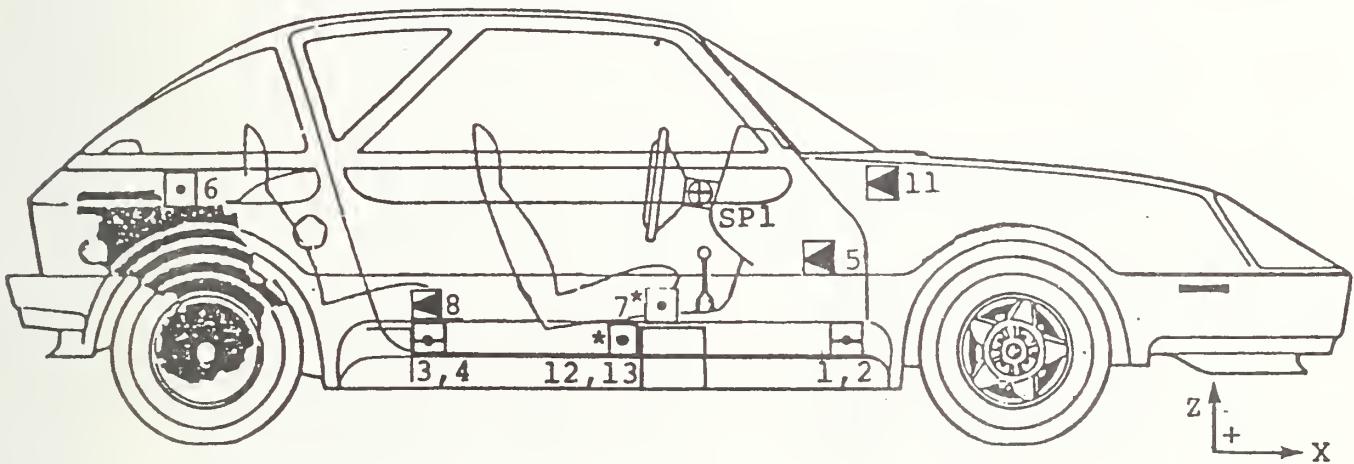
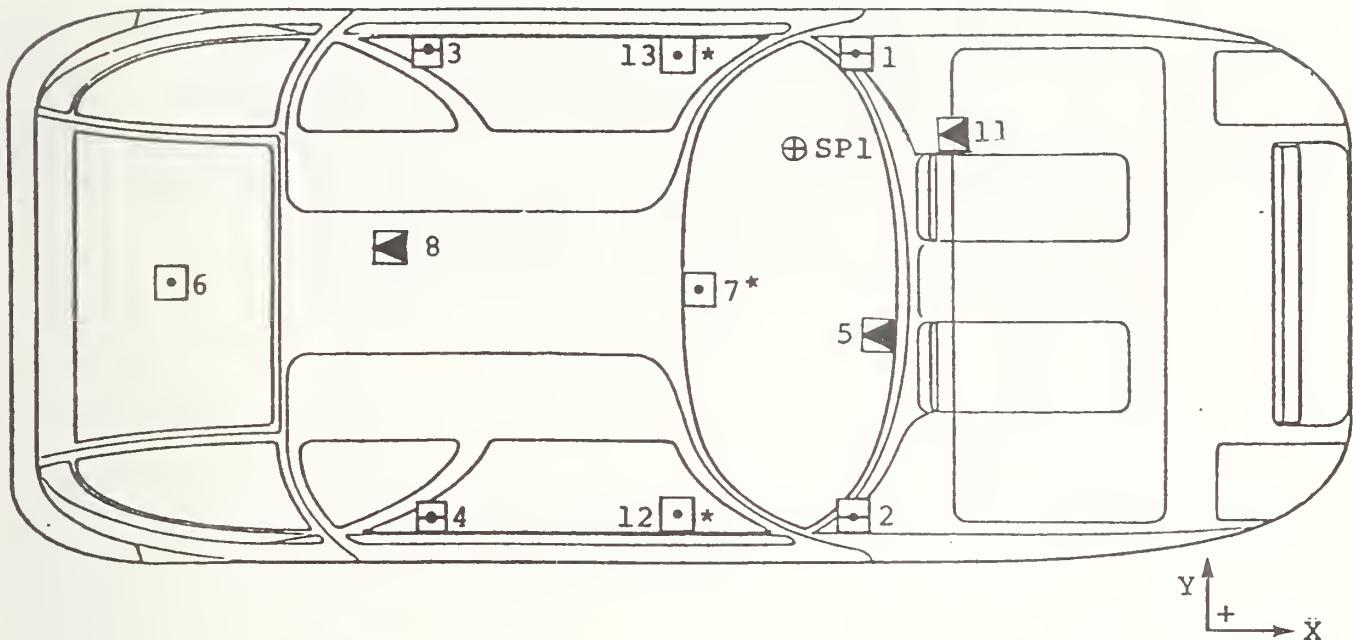
3.3 DUMMY INSTRUMENTATION

Two instrumented, Part 572, 50th percentile dummies were positioned in the driver and right front passenger locations in each vehicle. Prior to and after test use, the dummies were calibrated according to FMVSS 208 procedures, inspected, and adjusted to meet the torque and characteristic requirements for these devices.

The following test dummy instrumentation was installed for the driver and right front passenger positions:

1. A primary and redundant triaxial accelerometer mount located in the head to measure its acceleration.

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- Triaxial Accelerometer (X, Y, Z)
- Biaxial Accelerometer (X, Z)
- ▨ Uniaxial Accelerometer (X)
- ⊕ String Potentiometer

See Table 3-1 for further information.

*Indicates a location requiring a redundant accelerometer(s).

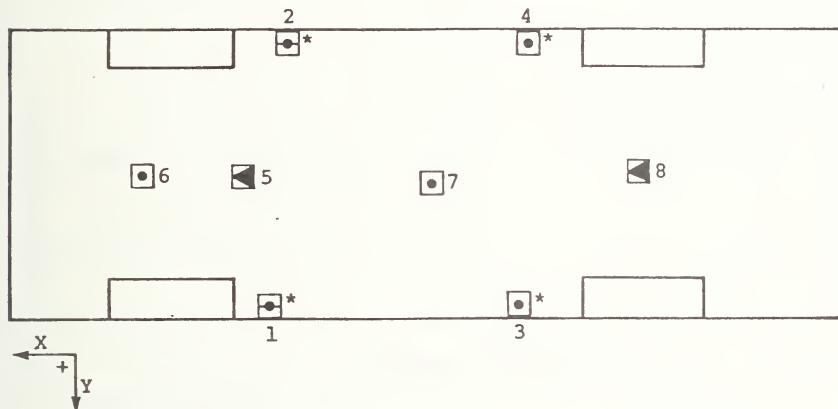
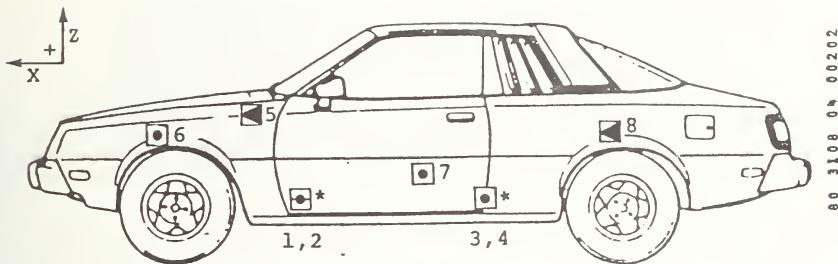
FIGURE 3-1. MINICARS RSV INSTRUMENTATION.

TABLE 3-1. MINICARS RSV INSTRUMENTATION

Vehicle Accelerometer		Coordinates (in.)			Maximum Expected Range (g's)			Data Channels
No.	Location	X	Y	Z	X	Y	Z	
1	Left A-Pillar	-68.0	26.5	28.0	100			1
2	Right A-Pillar	-68.0	-26.5	28.0	100			1
3	Below Left B-Pillar, Inside Sill	-117.6	23.0	13.8	100			1
4	Below Right B-Pillar, Inside Sill	-117.6	-23.0	13.8	100			1
5	Front Wall, Inside Com- partment, Right of Center Tunnel	-57.2	-6.0	24.0	100		100	2
6	Engine	Top Center of Block, Valve Cover Removed			200	200	200	3
7	Nominal Center of Gravity	-99.8	-1.4	16.0	100	25	25	3
7R	Nominal Center of Gravity	-97.5	-1.4	16.0	100	25	25	3
8	Rear Seat Crossmember, Left of Fuel Cell Tunnel	-119.3	7.0	13.3	100		25	2
11	Over Steering Wheel Inside Luggage Com- partment	-56.8	12.1	37.0	100		100	2
12	Behind LF Seat Cross- member Inside Sill	-94.8	-23.0	13.0	100	25	25	3
12R	Behind LF Seat Cross- member Inside Sill	-94.8	-23.0	9.0	100			1
13	Behind RF Seat Cross- member Inside Sill	-94.8	23.0	13.0	100	25	25	3
13R	Behind RF Seat Cross- member Inside Sill	-94.8	23.0	9.0	100			1
<u>Occupant Instrumentation (Two Occupants)</u>								27
Head Accelerometers			200*	200*	200*			12
Chest Accelerometers			100*	100*	100*			12
Pelvis Accelerometer			100	100	100			6
Femur Load Cells						3000 lb		4
<u>Other Instrumentation</u>								34
String Pot-Steering Wheel								1
Passenger Diffuser Pressure								1
Passenger Air Bag Pressure								1
Time of Air Bag Fire								1
								4

Coordinate reference: X - Front Bumper G, Y-G, Z - Ground.

*Redundant accelerometers.



- Triaxial Accelerometer (X,Y,Z)
- Biaxial Accelerometer (X,Z)
- Uniaxial Accelerometer (X)

See Table 3-2 for further information

*Indicates a location requiring a redundant accelerometer(s)

FIGURE 3-2. DODGE CHALLENGER INSTRUMENTATION.

TABLE 3-2. DODGE CHALLENGER INSTRUMENTATION

Vehicle Accelerometer		Coordinates (in.)			Maximum Expected Range (g's)			Data Channels
No.	Location	X	Y	Z	X	Y	Z	
1	Left A-Pillar	-59.9	27.0	16.0	100			1
1R	Left A-Pillar	-59.9	27.0	19.0	100			1
2	Right A-Pillar	-59.9	-27.0	16.0	100			1
2R	Right A-Pillar	-59.9	-27.0	19.0	100			1
3	Left B-Pillar	-101.3	25.0	12.0	100	25	25	3
3R	Below Left B-Pillar	-107.8	22.0	10.4	100			1
4	Right B-Pillar	-101.3	-25.0	12.0	100	25	25	3
4R	Below Right B-Pillar	-107.8	-22.0	10.4	100			1
5	Front Firewall	-48.5	0.0	33.0	100		100	2
6	Engine	-38.4	7.0	26.3	250	250	250	3
7	Nominal Center of Gravity	-86.3	0.0	15.5	100	25	25	3
8	Rear Deck	-134.8	0.0	21.5	100		25	2
								22

Occupant Instrumentation (Two Occupants)

Head Accelerometers	300*	300*	300*	12
Chest Accelerometers	150*	150*	150*	12
Pelvis Accelerometer	150	150	150	6
Femur Load Cells			3000 lb	4

Total Data Channels Required = 56

Coordinate reference: X - Front Bumper G, Y - G, Z - Ground.
*Redundant accelerometers.

2. A primary and redundant triaxial accelerometer mount located in the chest cavity to measure chest acceleration.
3. A triaxial accelerometer mount located in the pelvic cavity to measure pelvis acceleration.
4. A femur load cell mounted in the femur of each upper leg to measure femur loads.

The instrumentation requirements for the dummy occupants are given in Tables 3-1 and 3-2.

3.4 PHOTO-INSTRUMENTATION REQUIREMENTS

Seventeen high-speed cameras and one panning (24 fps) camera were used as shown in Table 3-3 to document the test. In addition, black-and-white stills and color slides were taken.

3.5 VEHICLE STRUCTURAL DEFORMATION DATA

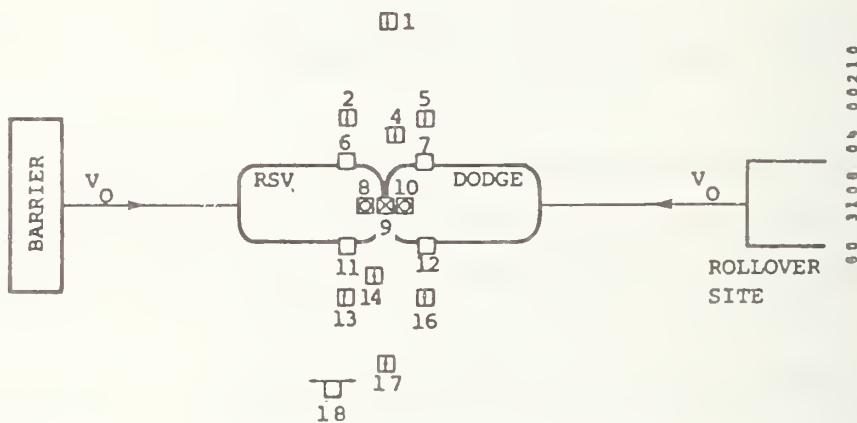
Pre-test and post-test measurements of the test vehicles (exterior and interior) were recorded. Data obtained from these measurements were used to determine frontal crush and occupant compartment intrusion.

TABLE 3-3. MINICARS RSV-TO-DODGE CHALLENGER PHOTO-INSTRUMENTATION
(TEST 3108-1)

Test No: 3108-1
Vehicle A (Away): Dodge
Vehicle B (Barrier): RSV

Test Date: September 10, 1980
Test Type: Vehicle-to-Vehicle Frontal Aligned Impact
Comments: Both vehicles moving head-on-impact.

CAMERA	YES	CAMERA SYMBOLS	FRAME RATE (f/s)	TIMING LIGHT SPEED
Stills	X	Pit	1. 100	1. 100 HZ (10 msec/light)
Slides	X	Ground	2. 200	2. 200 HZ (5 msec/light)
Movie	X	Barrier	3. Other 24	3. Other
Polaroid	X	Overhead	4. 400	
Video		On-Board	5. 500	
		Panning		



Loc No.	Location	Field of View	Camera Type	Lens Size (mm)	Nominal Frm Rate	Actual Tmng Spd(hz)
1	North Side	Overall	LoCam	28	4	None
2	North Side	RSV Driver Dummy Kinematics	Millikens	16	4	*
3	North Side	Closeup-Vehicles Interface	Millikens	16	4	None
4	North Side	Closeup-Vehicles Interface	Photosonics	25	1	100
5	North Side	Dodge Passenger Dummy Kinematics	Millikens	16	4	100
6	RSV-DS On-Board	RSV Driver Dummy Kinematics	Photosonics	8	1	100
7	Dodge-PS On-Board	Dodge Passenger Dummy Kinematics	Photosonics	8	1	101
8	Pit	Underside Front End of RSV	Photosonics	15	1	100
9	Overhead	Vehicles Interface	Millikens	10	4	101
10	Pit	Underside Front End of Dodge	Photosonics	15	1	102
11	RSV PS On-Board	RSV Passenger Dummy Kinematics	Photosonics	8	1	100
12	Dodge DS On-Board	Dodge Driver Dummy Kinematics	Photosonics	8	1	99
13	South Side	RSV Passenger Dummy Kinematics	Millikens	16	4	None
14	South Side	Closeup-Vehicles Interface	Photosonics	25	1	106
15	South Side	Closeup-Vehicles Interface	Millikens	25	4	57
16	South Side	Dodge Driver Dummy Kinematics	Millikens	35-75	4	101
17	South Side	Overall	LoCam	25	4	None
18	TBD	Panning-Test and Results		-	3	-

*Camera 2 did not run.

4.0 TEST RESULTS

This section of the report presents the results of the crash test in the form of a comparison of the data from both vehicles.

The complete body of data obtained during the test is presented in the following appendices:

- Appendix A - Minicars RSV M5-11 occupant and vehicle data plots.
- Appendix B - 1979 Dodge Challenger occupant and vehicle data plots.
- Appendix C - Additional photographs of the crash test.
- Appendix D - Pre-test acceptance certificate and vehicle information documentation.
- Appendix E - Pre-test and post-test dummy calibration data.

Tables 4-1 and 4-2 present a summary of the test conditions and post-test observations.

4.1 VEHICLE TEST RESULTS

A summary of the vehicles' accelerometer data is shown in Table 4-3. The Minicars and Dodge Challenger maximum occupant compartment acceleration was 39 g and 37 g, respectively. These are based on the average of locations 12X and 13X channels for the Minicars compartment, and of locations 3X and 4X channels for the Dodge compartment. As noted in Table 4-1 and 4-2, the static crush measured at the centerline of the vehicle at bumper level for the Minicars RSV was 40 inches and 28.8 inches for the Challenger. The mutual dynamic crush of both vehicles obtained from film analysis was 77 inches (see Figure 4-1). The mutual crush

TABLE 4-1. CRASH TEST SUMMARY - MINICARS RSV

Test No.	3108-1	Date:	9/10/80	Time:	14:46
Vehicle:	RSV M5-11	Test Speed:	43.26 mph	Amb. Temp:	94 °F
Test Weight (lb):	3087	LF:	733	RF:	679
		LR:	838	RR:	837

Maximum Static Crush (in.) - 40.0 (L of vehicle at bumper height)

Maximum Rebound Velocity - 3 mph

Dummies

Type	Part 572, 50th Percentile Male (Alderson)
------	---

Location	LF and RF
----------	-----------

Restraint System	Driver: air bag mounted on steering wheel Passenger: air bag mounted in dash
------------------	---

Number of Data Channels	65
-------------------------	----

Number of On-Board Cameras	One on each door
----------------------------	------------------

Post-Test Observations

Glazing: Windshield cracked completely. Retention loss from a point 11.5 inches right of G, at top, down right side, and across bottom to bottom corner on left side, except for 2 inches retained on right side bottom rear right corner. Right side door main window cracked over entire surface.

Doors: Right side door opened during crash due to failure of the five rivets holding the latching mechanism to the door. Left side door required tools to open after test, and opened when the corresponding five rivets failed.

Roof: No observable damage.

Steering Column and Wheel: No observable damage. Minimal observable steering column intrusion.

Seats: No observable failure in seat backs or tracks.

Restraint System: Both air bags inflated and deployed.

Dummies: No head or chest contacts other than air bags. Knee contacts at knee restraints.

Miscellaneous: No fuel system leakage. Coolant leakage observed. Hood flew off. Rear view mirror came off. Moderate floor pan intrusion.

TABLE 4-2. CRASH TEST SUMMARY - DODGE CHALLENGER

Test No. 3108-1 Date: 9/10/80 Time: 14:46
 Vehicle: Dodge Challenger Test Speed: 43.26 mph Amb. Temp: 94°F
 Test Weight (lb): 3082 LF: 742 RF: 672 LR: 831 RR: 837
Maximum Static Crush (in.) - 28.8 (% of vehicle at bumper height)

Maximum Rebound Velocity - 8 mph

Dummies

Type Part 572, 50th Percentile Male (Alderson), calibrated,
 certified

Location LF and RF

Restraint System Driver: production 3-point belt with ELR
Passenger: production 3-point belt with ELR

Number of Data Channels 56

Number of On-Board Cameras One on each door

Post-Test Observations

Glazing: Windshield cracked over entire surface and shattered
 near bottom. Retention loss approx. 3 inches on bottom
 near left corner.

Doors: Both doors opened with difficulty

Roof: No damage.

Steering Column and Wheel: Extensive bending of rim caused by
 dummy head and chest contact. Apparent sizeable intrusion of column. Column remained attached to all underdash structures.

Seats: Passenger side seat back adjusting mechanism slipped during impact, so that the seat ended up in the full reclining position. The adjusting mechanism and seat back operated satisfactorily post-test. Driver seat back angled more toward rear than pre-test.

Restraint System: Both driver and passenger belt systems showed approximately three inches of static extension from retractor housing.

Dummies: Driver: head contact at top of steering wheel (forehead) and top of steering wheel hub (chin). Chest contact at bottom of steering wheel. Knees contacted underside of dash. Passenger: head contact top of dash above glove box. Knees contacted underside of dash below glove box.

Miscellaneous: Extensive damage to dashboard and center console. Severe toeboard intrusion both sides. Coolant leakage. Fluid leakage from RR shock absorber. No fuel system leakage.

TABLE 4-3. SUMMARY OF VEHICLE ACCELEROMETER DATA (TEST 3108-1)

Accelerometer Number	Minicars RSV		Dodge Challenger	
	A (g)	Time (msec)	A (g)	Time (msec)
1X	-64.5	63	-45.4	58
1XR	--	--	-41.9	57
2X	-89.8	61	-45.2	57
2XR	--	--	-48.1	48
3X	-36.4	69	-38.4	59
3XR	--	--	-41.3	56
3Y	--	--	7.3	73
3Z	--	--	16.1	71
4X	Instrumentation Failure		-38.7	47
4XR	--	--	-39.9	56
4Y	--	--	-13.8	48
4Z	--	--	15.7	62
5X	-92.5	52	69.7	67
5Z	43.5	59	-53.8	50
6X	-62.7	74	-100.8	31
6Y	10.7	34	-28.4	43
6Z	7.7	24	32.1	69
7X*	-55.2	52	-49.0	68
7XR*	-36.2	65	--	--
7Y*	-12.7	28	-15.1	32
7YR*	20.3	80	--	--
7Z*	40.0	89	46.2	67
7ZR*	-15.8	47	--	--
8X	-50.2	26	-39.1	66
8Z	16.6	30	25.4	66
11X	-56.8	65	--	--
11Z	15.1	43	--	--
12X	-43.3	27	--	--
12XR	-40.8	25	--	--
12Y	14.9	31	--	--
12Z	29.4	72	--	--
13X	-35.0	27	--	--
13XR	-38.7	27	--	--
13Y	13.6	27	--	--
13Z	14.4	60	--	--
Average of 1X & 2X	-66.0	62	-40.2	58
Average of 1XR & 2XR	--	--	-41.2	57
Average of 3X & 4X	--	--	-37.0	56
Average of 3XR & 4XR	--	--	-40.6	56
Average of 12X & 13X	-39.2	27	--	--
Average of 12XR & 13XR	-36.5	26	--	--

*Data for RSV location 7 and 7R are questionable. Accelerometer mounts came loose during crash.

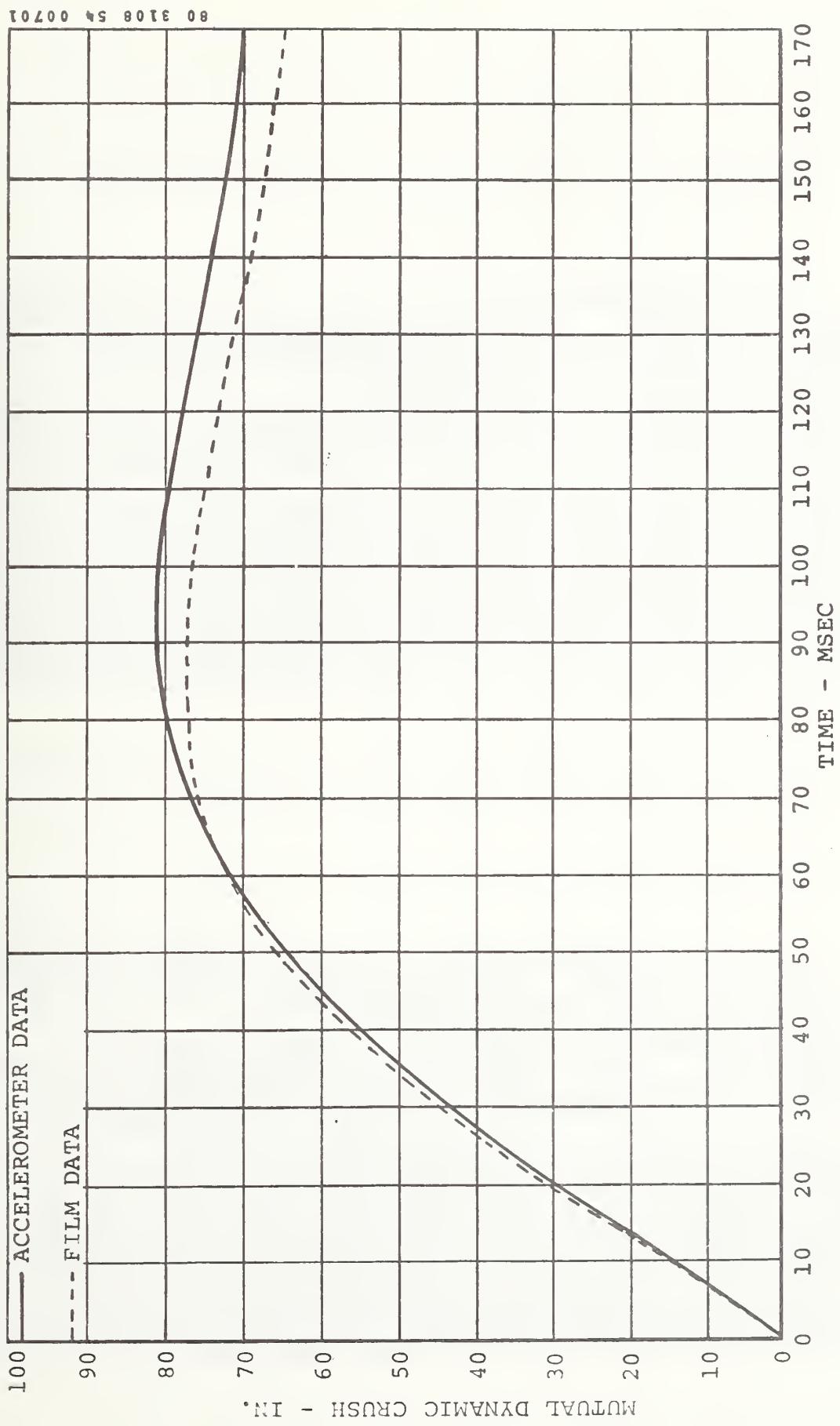


FIGURE 4-1. COMPARISON OF MUTUAL DYNAMIC CRUSH FROM ACCELEROMETER DATA AND FILM DATA (TEST 3108-1).

obtained from integration of vehicle accelerometer data shown on this plot is not considered as accurate as film analysis due to the change in accelerometer orientation with respect to ground during the crash. Pre-test and post-test views of the vehicles are shown in Figures 4-2 through 4-5.

Because of the significant effect on the vehicle force path due to the front bumper interface, measurements were taken to assure bumper match within satisfactory tolerance. These dimensions are documented in Appendix D (page D-2).

The vehicle exterior frontal and occupant compartment interior profiles are presented in Tables 4-4 through 4-7. Photographs of the occupant compartment intrusion are shown in Figures 4-6 and 4-7.

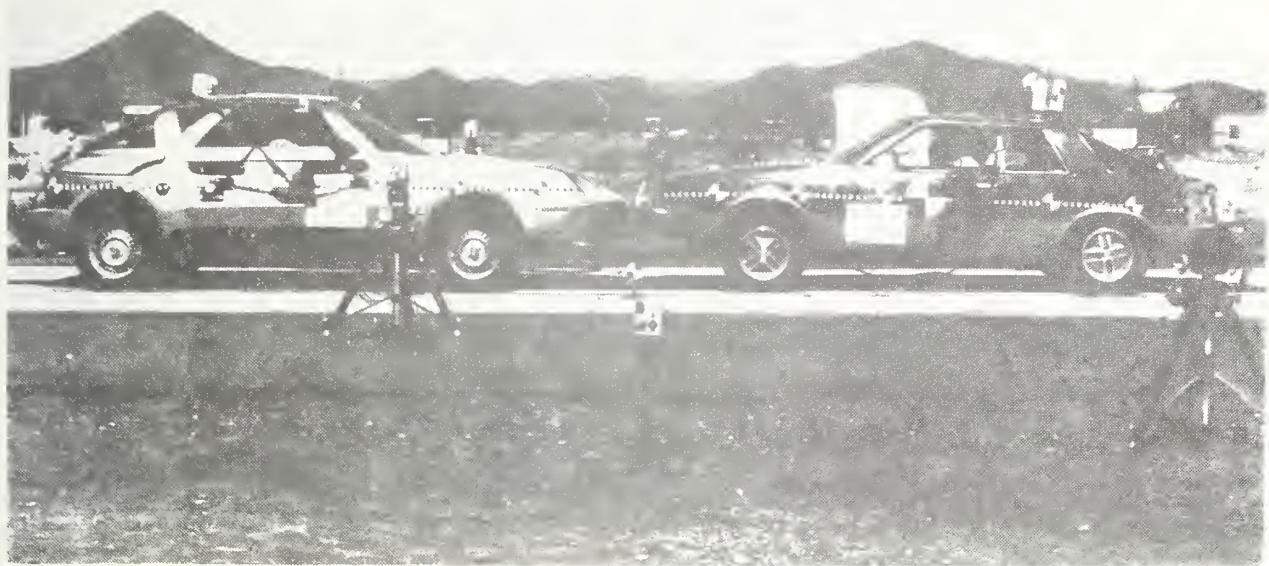
A list of the pre-test conditions for the test vehicles documented just prior to test are shown in Tables 4-8 and 4-9.

4.2 OCCUPANT TEST RESULTS

A summary of the occupant accelerations data and injury criteria for the head, chest and femurs for both vehicles are presented in Tables 4-10 and 4-11. The pre- and post-test photographs of the occupants are shown in Figures 4-8 through 4-11.

The air bag sensor closure occurred at 16 ms and both air bags subsequently deployed. Plots of the air bag sensor fire, steering wheel collapse, passenger diffuser pressure, and passenger air bag pressure are presented in Appendix A. The RSV dummy responses were well within the injury criteria requirements of

001925



006984

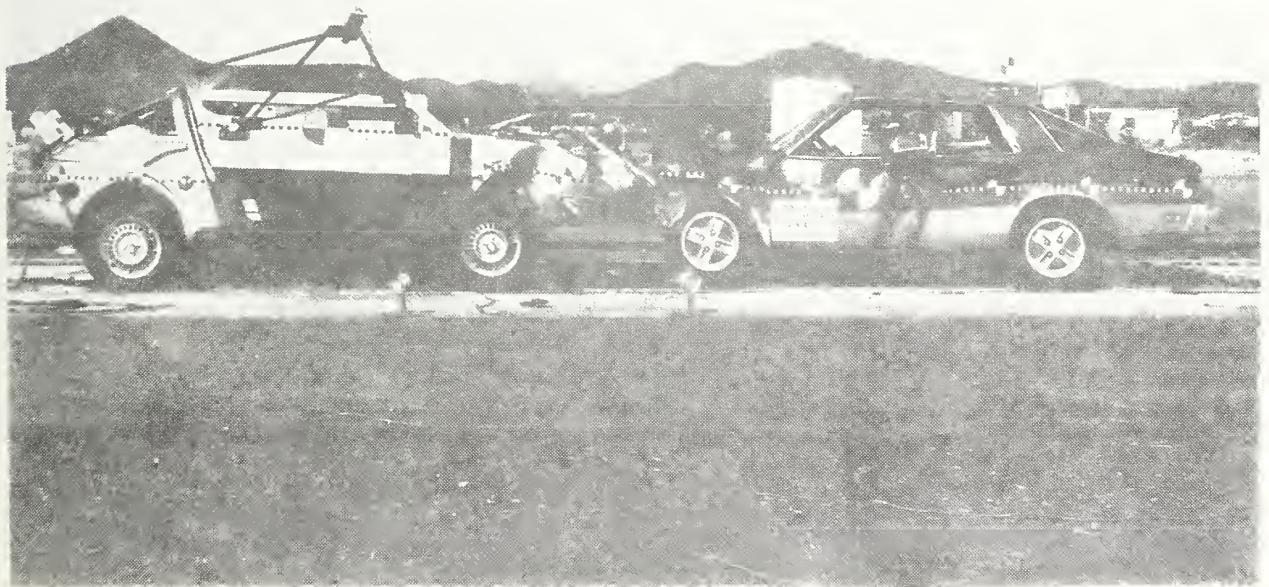


FIGURE 4-2. PRE- AND POST-TEST OVERALL VIEW.



22
001920



22
006600

MINICARS RS'
DODGE CHALLEN
FRONTAL TES
3108-1

MINICARS
DODGE CHAL
FRONTAL
3108-1

FIGURE 4-3. PRE-AND POST-TEST SIDE VIEW OF VEHICLE FRONT.

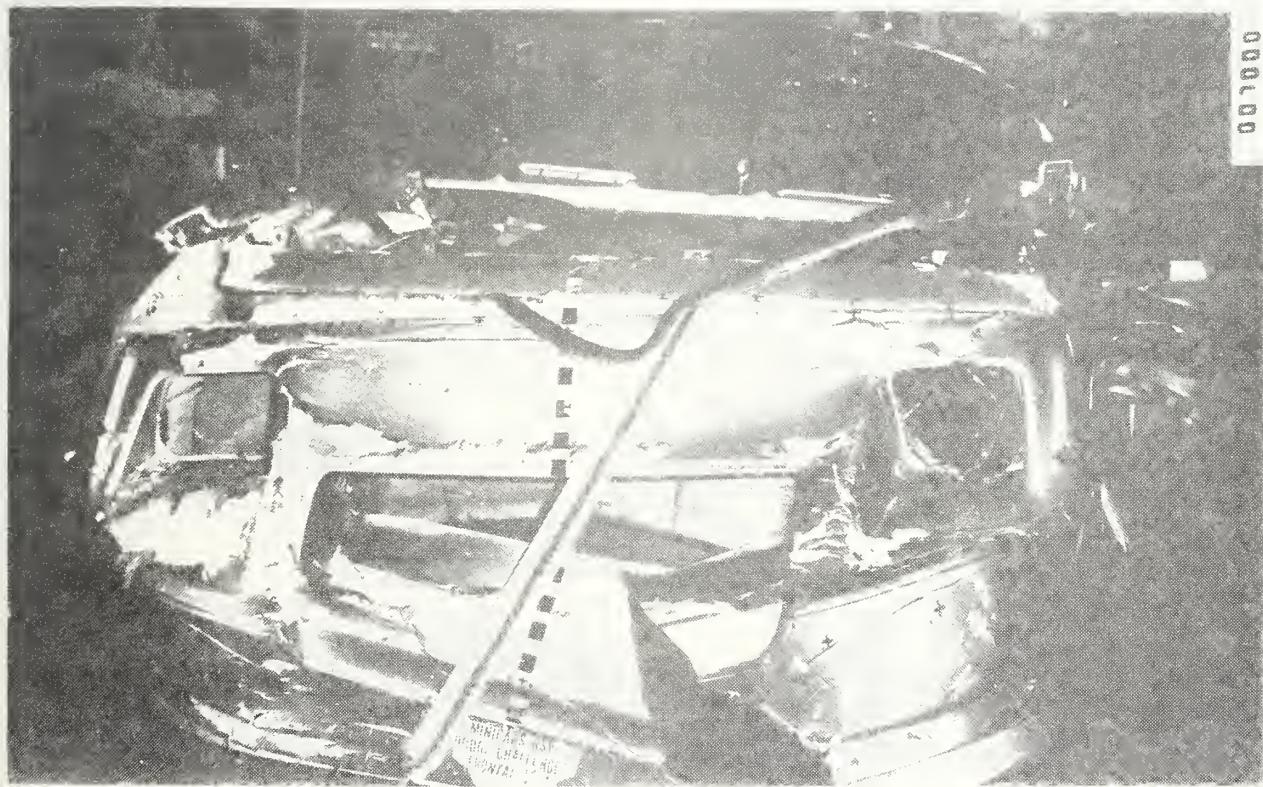
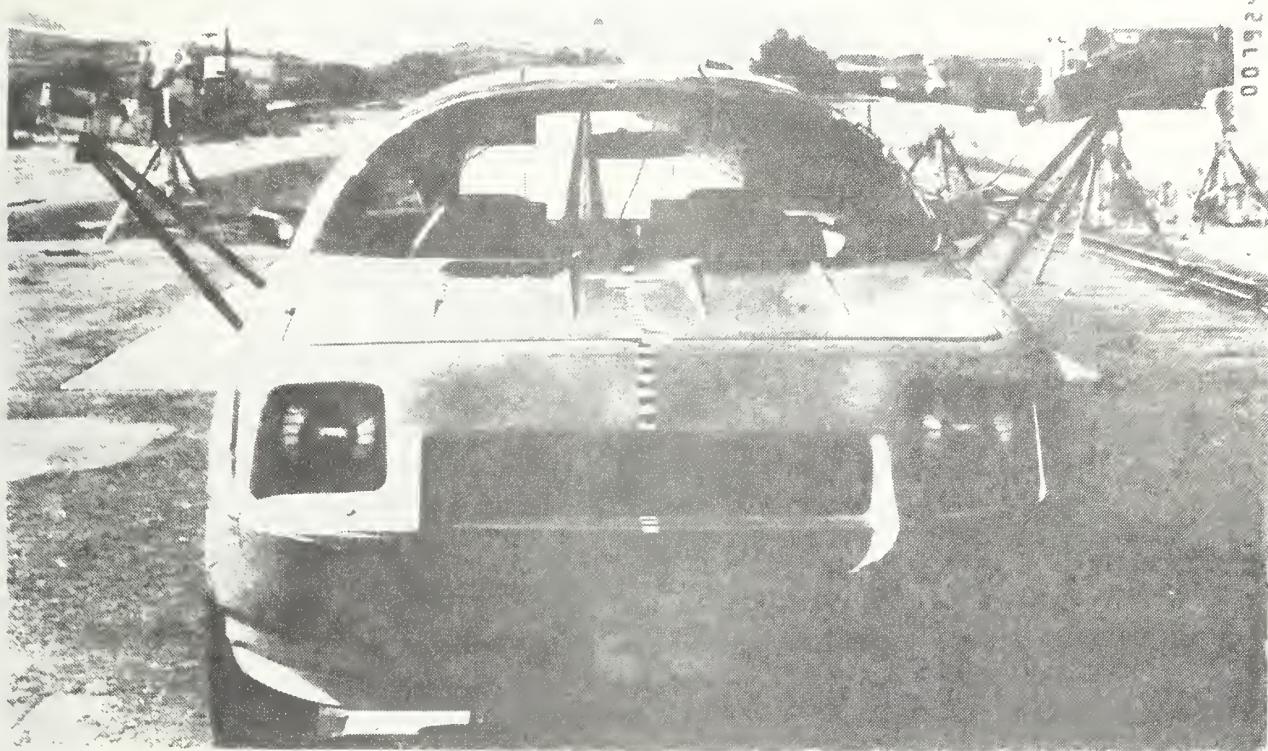


FIGURE 4-4. PRE- AND POST-TEST FRONTAL VIEW OF MINICARS RSV.

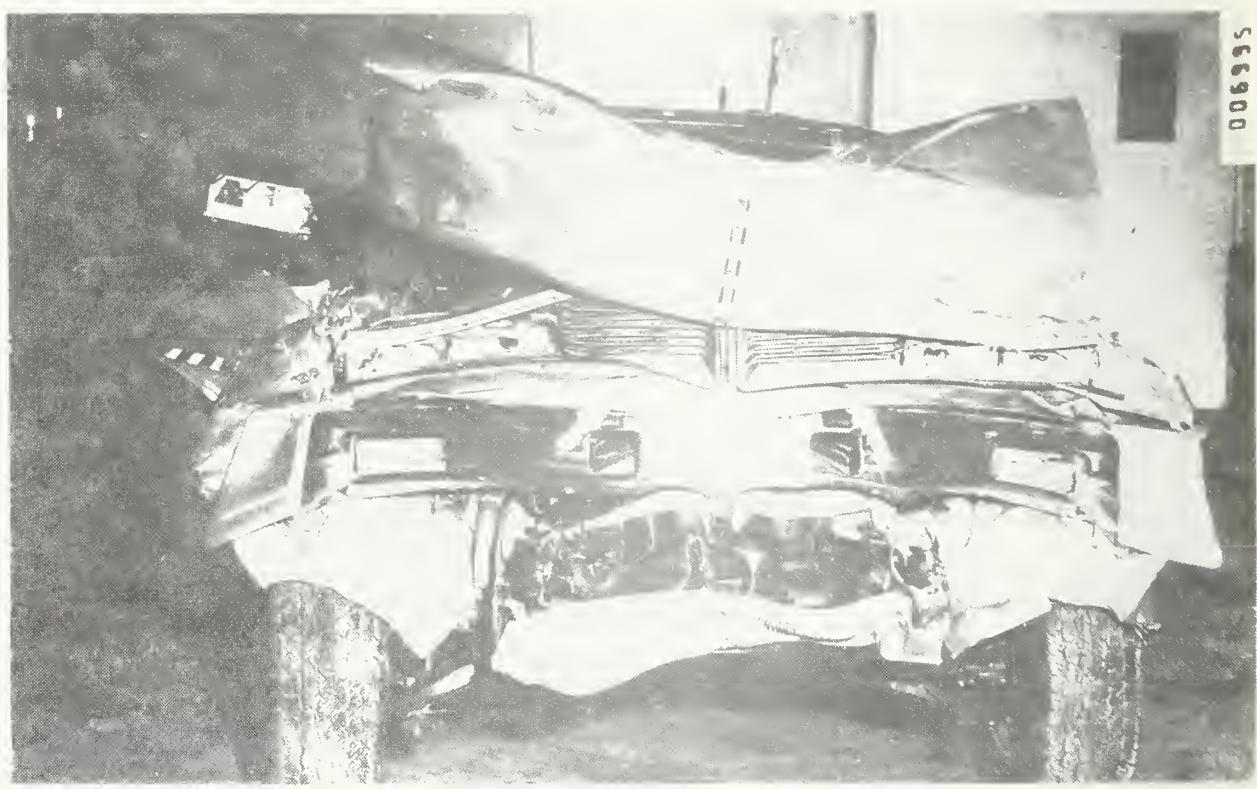
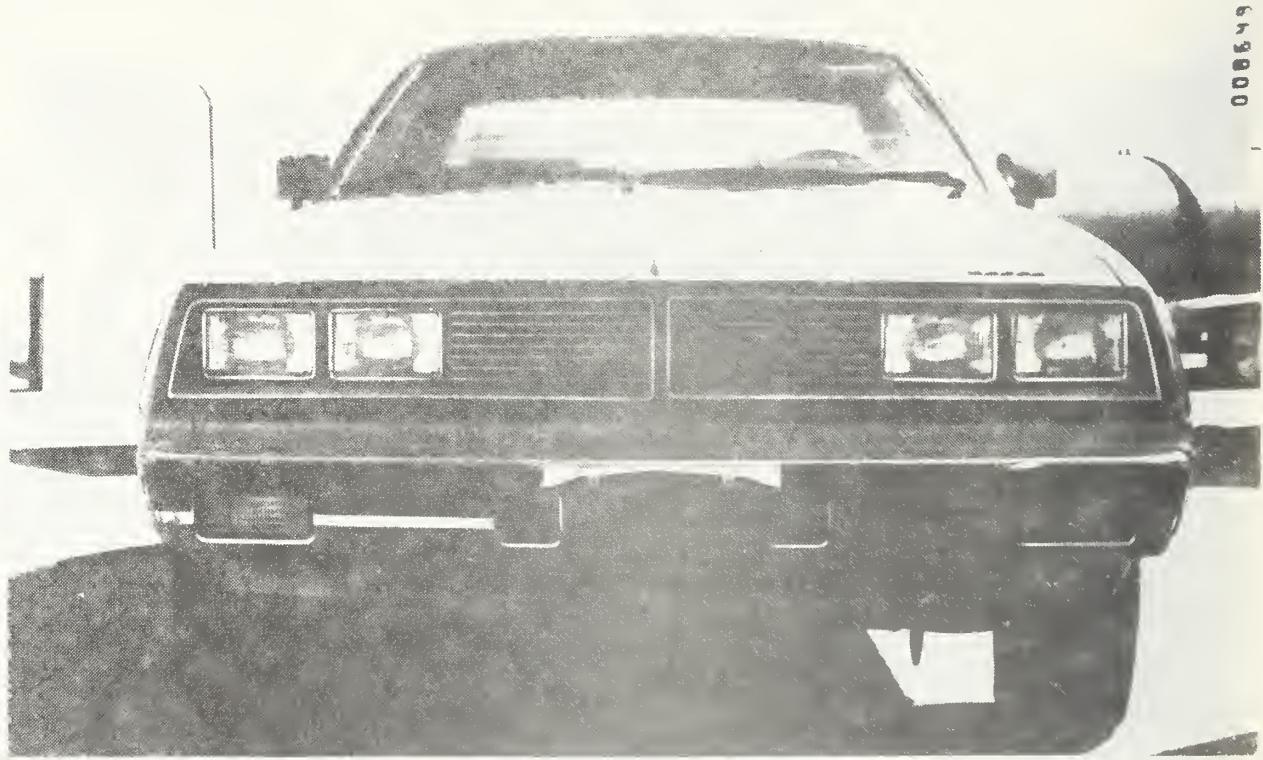


FIGURE 4-5. PRE- AND POST-TEST FRONTAL VIEW OF DODGE CHALLENGER.

TABLE 4-4. SUMMARY OF MINICARS RSV M5-11 FRONTAL STATIC CRUSH (IN.)

<u>Level</u>	<u>Passenger Side</u>						<u>Driver Side</u>				
	Inches From Centerline										
	<u>30</u>	<u>24</u>	<u>18</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>6</u>	<u>12</u>	<u>18</u>	<u>24</u>	<u>30</u>
Top of Bumper	27.4	34.8	38.6	41.2	41.1	40.0	38.4	34.4	30.6	27.6	20.4

TABLE 4-5. SUMMARY OF DODGE CHALLENGER FRONTAL STATIC CRUSH (IN.)

<u>Level</u>	<u>Passenger Side</u>						<u>Driver Side</u>				
	Inches From Centerline										
	<u>27</u>	<u>24</u>	<u>18</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>6</u>	<u>12</u>	<u>18</u>	<u>24</u>	<u>27</u>
Hood	23.4	23.7	24.6	25.1	21.3	19.8	20.4	21.9	22.6	23.5	22.5
Grille Bottom	29.6	29.0	28.5	27.1	25.5	23.2	25.1	26.5	27.7	27.7	28.1
Bumper	32.9	33.1	32.1	31.0	29.8	28.8	30.3	30.5	31.2	32.1	32.1

TABLE 4-6. SUMMARY OF MINICARS RSV M5-11 STATIC INTERIOR INTRUSION (IN.)

<u>Level</u>	<u>Driver Side</u>				<u>Passenger Side</u>			
	Toeboard Intrusion (in.) Inches From Center Tunnel							
<u>Ht. Above Floor (in.)</u>	<u>16.8</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>12</u>	<u>15.5</u>
10.1	4.1	4.1	4.4	3.8	4.9	5.8	7.3	7.8
	<u>17.0</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>12</u>	<u>17.0</u>
5.6	1.6	2.8	1.8	0.6	1.9	3.5	4.9	5.0
	<u>18.0</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>12</u>	<u>17.9</u>
0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.8

NOTE: Steering Column Dynamic Collapse - 4.6 in.
Lower dash intrusion measurements could not be taken for the RSV.

TABLE 4-7. SUMMARY OF DODGE CHALLENGER STATIC INTERIOR INTRUSION (IN.)

<u>Level</u>	<u>Driver Side</u>				<u>Passenger Side</u>			
	Lower Dash Intrusion (in.) Inches From Centerline							
<u>Ht. Above Floor (in.)</u>	<u>24</u>	<u>18</u>	<u>12</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>12</u>	<u>18</u>
16.8	1.6	1.5	5.2	3.9	4.2	4.5	1.0	0.5
								2.4
	Toeboard Intrusion (in.) Inches From Center Tunnel							
<u>Ht. Above Floor (in.)</u>	<u>17</u>	<u>12</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>12</u>	<u>17</u>
7.5	4.4	7.5	9.6	7.6	6.7	7.6	5.5	4.0
3.5	5.3	9.4	10.9	7.8	4.5	6.4	4.9	3.6
0.0	5.0	7.1	8.2	7.0	0.4	2.1	1.3	0.5

NOTE: Steering Column Static Intrusion - 4.1 in. (X Direction)

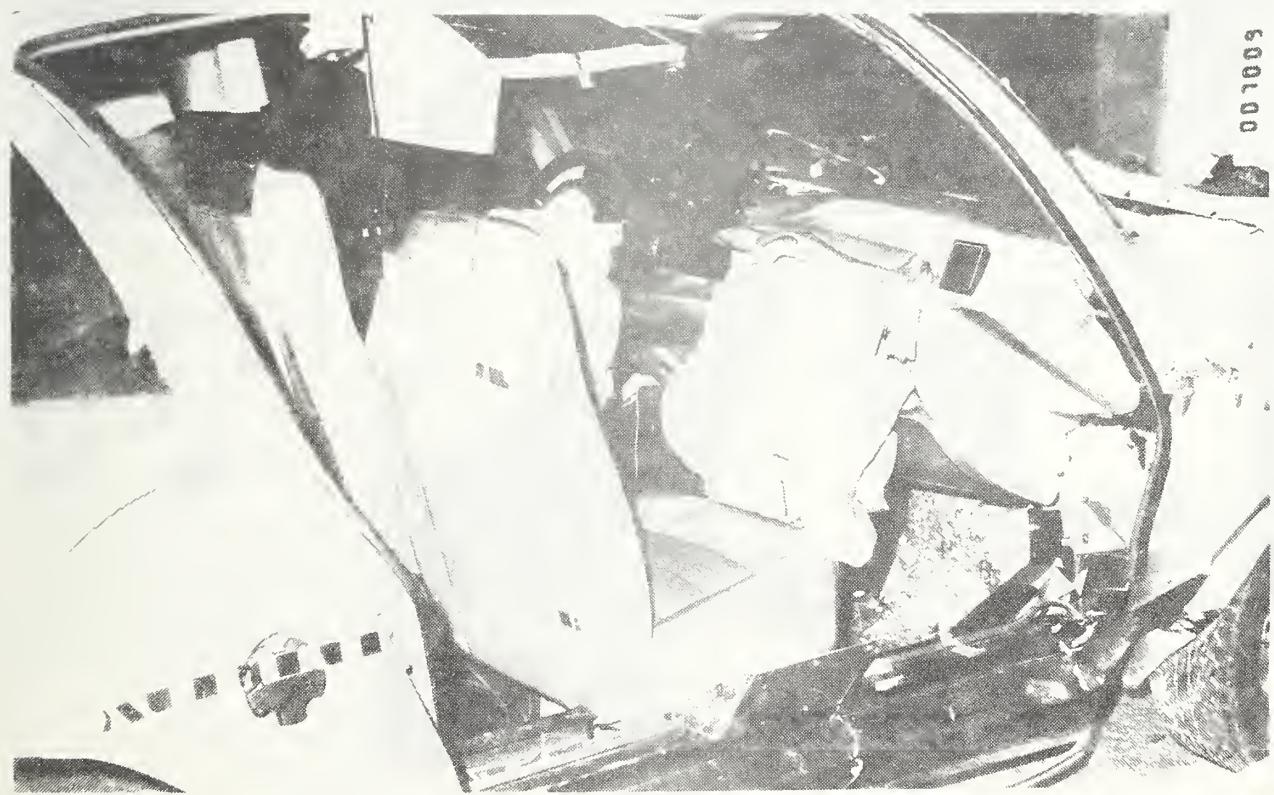
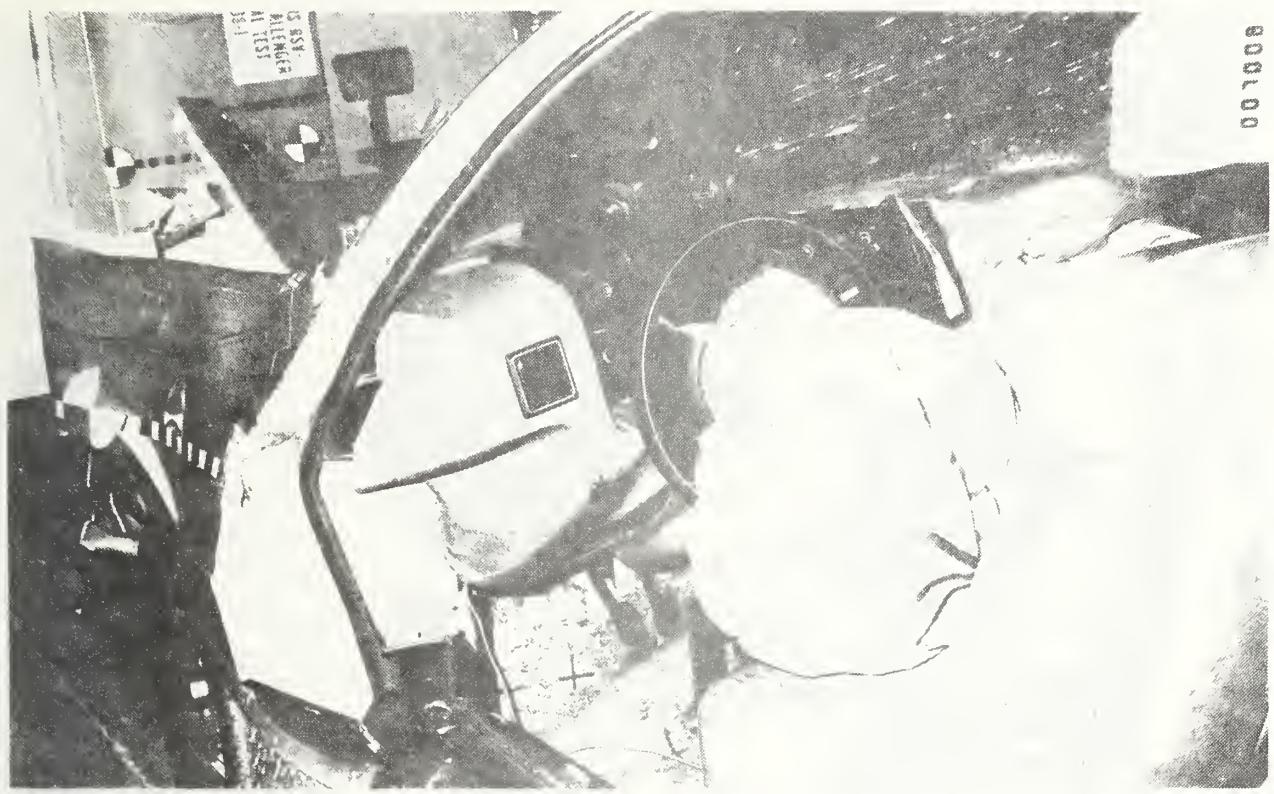


FIGURE 4-6. MINICARS RSV DRIVER AND PASSENGER COMPARTMENT DEFORMATION.



FIGURE 4-7. DODGE CHALLENGER DRIVER AND PASSENGER COMPARTMENT DEFORMATION.

TABLE 4-8. VEHICLE PRE-TEST CONDITIONS

TEST NO.	3108-1	VEHICLE:	RSV M5-11	TEST DATE:	9/10/80
HEAD RESTS -	up	down	other	fixed	
FRONT SEAT -	forward	midpoint	rearward	latched	welded per Minicars procedures
FRONT SEAT TILT -	forward	midpoint	back	other	fixed none
REAR SEAT -	in place		removed		
STEERING WHEEL -	up	midpoint	down		not adjustable
SUN VISORS -	up	down	removed		
GLOVE COMPARTMENT -	locked	closed		none	
SEAT BELTS -	fastened	unfastened	removed	none	
SHOULDER HARNESSSES -	fastened	unfastened	removed	passenger only	
VENT WINDOWS -	closed	open	removed	none	
LEFT FRONT WINDOW -	up	down	removed	none	stationary
RIGHT FRONT WINDOW -	up	down	removed	none	stationary
LEFT REAR WINDOW -	up	down	removed	none	stationary
RIGHT REAR WINDOW -	up	down	removed	none	stationary
BACKLIGHT -	in place	removed			
LEFT FRONT DOOR -	closed	locked	removed		
RIGHT FRONT DOOR -	closed	locked	removed		
LEFT REAR DOOR -	closed	locked	removed	none	
RIGHT REAR DOOR -	closed	locked	removed	none	
ENGINE -	in place	removed	mounts modified	- parts removed	
TRANSMISSION -	neutral	other	removed		
DRIVESHAFT -	in place	removed			
PARKING BRAKE -	off	on	disconnected		
FRONT BUMPER -	in place	removed	none		
REAR BUMPER -	in place	removed	none		
HOOD -	in place	removed			
WINDSHIELD WIPERS -	in place	removed			
FUEL TANK -	95% full	empty	other	Stoddard Solvent	
RADIATOR -	full	empty	none	removed	partially drained
BATTERY -	in place	removed	(fully charged)		
SPARE TIRE -	in place	removed	none		
JACK -	in place	removed	none		
WHEEL COVERS -	in place	removed	none		
BALLAST -	none	lb @			
AIR BAG CHECK TIME -		Less than 9 sec		no air bags	
DUMMY LOCATIONS -	LF	CF	RF	LR	CR RR none
DUMMY POSITIONING CRITERIA -		FMVSS 208	other (Minicars)	N/A	

TABLE 4-9. VEHICLE PRE-TEST CONDITIONS

TEST NO.	VEHICLE: Challenger			TEST DATE:
HEAD RESTS -	up	down	other	fixed
FRONT SEAT -	forward	midpoint	rearward	latched welded
FRONT SEAT TILT*	forward	midpoint	back	other fixed none
REAR SEAT -	in place	removed		
STEERING WHEEL -	up	midpoint	down	not adjustable
SUN VISORS -	up	down	removed	
GLOVE COMPARTMENT -	locked	closed		none
SEAT BELTS -	fastened	unfastened	removed	none
SHOULDER HARNESSSES -	fastened	unfastened	removed	passenger only
VENT WINDOWS -	closed	open	removed	none
LEFT FRONT WINDOW -	up	down	removed	
RIGHT FRONT WINDOW -	up	down	removed	
LEFT REAR WINDOW -	up	down	removed	none stationary
RIGHT REAR WINDOW -	up	down	removed	none stationary
BACKLIGHT -	in place	removed		
LEFT FRONT DOOR -	closed	locked	removed	
RIGHT FRONT DOOR -	closed	locked	removed	
LEFT REAR DOOR -	closed	locked	removed	none
RIGHT REAR DOOR -	closed	locked	removed	none
ENGINE -	in place	removed	mounts modified	parts removed
TRANSMISSION -	neutral	other		removed
DRIVESHAFT -	in place	removed		
PARKING BRAKE -	off	on	disconnected	
FRONT BUMPER -	in place	removed		none
REAR BUMPER -	in place	removed		none
HOOD -	in place	removed		
WINDSHIELD WIPERS -	in place	removed		
FUEL TANK -	95% full	empty	other	Stoddard Solvent
RADIATOR -	full	empty	none	removed partially drained
BATTERY -	in place	removed	(fully charged)	
SPARE TIRE -	in place	removed		none
JACK -	in place	removed		none
WHEEL COVERS -	in place	removed		none
BALLAST -	none	lb @		
AIR BAG CHECK TIME -	Less	than 10 sec		no air bags
DUMMY LOCATIONS -	LF	CF	RF	LR CR RR none
DUMMY POSITIONING CRITERIA -	FMVSS	208	other	N/A

*Seat back only.

TABLE 4-10. SUMMARY OF MINICARS RSV OCCUPANT RESPONSE DATA
(TEST 3108-1)

Response Parameter	Filter (Hz)	Injury(1) Criteria	Left Front Dummy (Driver)		Right Front Dummy (Passenger)	
			Maximum Value A (G)	Maximum Value T (msec)	Maximum Value A (G)	Maximum Value T (msec)
Head	X	1600	-52 (-55)	80 (75)	-69 (-74)	69 (69)
	Y	1600	-8 (15)	69 (76)	-12 (-7)	132 (132)
	Z	1600	-31 (-33)	69 (72)	-33 (-31)	68 (68)
	R	1600	56 (62)	76 (75)	75 (81)	69 (68)
SI			815 (908)	200 (200)	871 (1039)	200 (200)
HIC		<1000	703 (834)	52/106 (54/103)	705 (914)	56/86 (56/86)
Chest	X	315	-42 (-38)	50 (51)	-40 (-50)	39 (38)
	Y	315	9 (15)	104 (34)	7 (14)	109 (38)
	Z	315	18 (-40)	99 (204)	18 (38)	42 (38)
	R	315	42 (43)	50 (98)	43 (64)	39 (38)
SI			395 (426)	200 (200)	364 (348)	200 (200)
Chest Acceler-(2) ation	R	315 <60 For 3 MS	>40 For (>41 For 3 MS)	3 MS	>38 For (>42 For 3 MS)	3 MS
Femur Loads(3)	L	1000 <2250	-1409	67	-1016	82
	R	1000 <2250	-1427	79	-957	97
Pelvis	X	315	-68	71	-38	32
	Y	315	20	52	-13	31
	Z	315	30	67	-36	34
	R	315	71	71	44	87

(1) Injury criteria levels defined in FMVSS 208.

(2) G level defined as value for cumulative duration of 3 msec.

(3) Negative loads are compression; positive loads are tension.

NOTE: Values in parentheses were obtained from redundant head and chest accelerometers.

TABLE 4-11. SUMMARY OF DODGE CHALLENGER OCCUPANT RESPONSE DATA
(TEST 3108-1)

Response Parameter	Filter (Hz)	Injury(1) Criteria	Left Front Dummy (Driver)		Right Front Dummy (Passenger)	
			Maximum Value		Maximum Value	
			A (G)	T (msec)	A (G)	T (msec)
Head	X	1600	-163 (-147)	78 (73)	-161 (-204)	85 (85)
	Y	1600	-41 (-44)	75 (73)	46 (-61)	85 (84)
	Z	1600	104 (-57)	75 (126)	-159 (-141)	92 (92)
	R	1600	172 (168)	75 (73)	169 (212)	85 (85)
SI			2688 (4435)	200 (200)	4617 (5273)	200 (200)
HIC		<1000	1690 (3434)	69/94 (11/130)	3630 (4375)	83/103 (83/104)
Chest	X	315	-89 (-79)	79 (79)	-74 (-72)	83 (83)
	Y	315	15 (21)	89 (95)	-43 (-56)	97 (97)
	Z	315	24 (22)	79 (84)	-21 (-19)	66 (66)
	R	315	92 (79)	79 (79)	77 (74)	83 (97)
SI			980 (944)	200 (200)	905 (953)	200 (200)
Chest Acceler-(2) ation	R	315	<60 For 3 MS	>60 For 11 MS (>60 For 11 MS)	>60 For 11 MS (>60 For 12 MS)	>60 For 10 MS (>60 For 12 MS)
Femur Loads(3) (lb)	L	1000	<2250	-983	61	-796 -1434
	R	1000	<2250	-917	61	80
Pelvis	X	315		-78	60	-56 55
	Y	315		-26	68	82
	Z	315		47	83	56 92
	R	315		85	61	76 32

(1) Injury criteria levels defined in FMVSS 208.

(2) G level defined as value for cumulative duration of 3 msec.

(3) Negative loads are compression; positive loads are tension.

NOTE: Values in parentheses were obtained from redundant head and chest accelerometers.

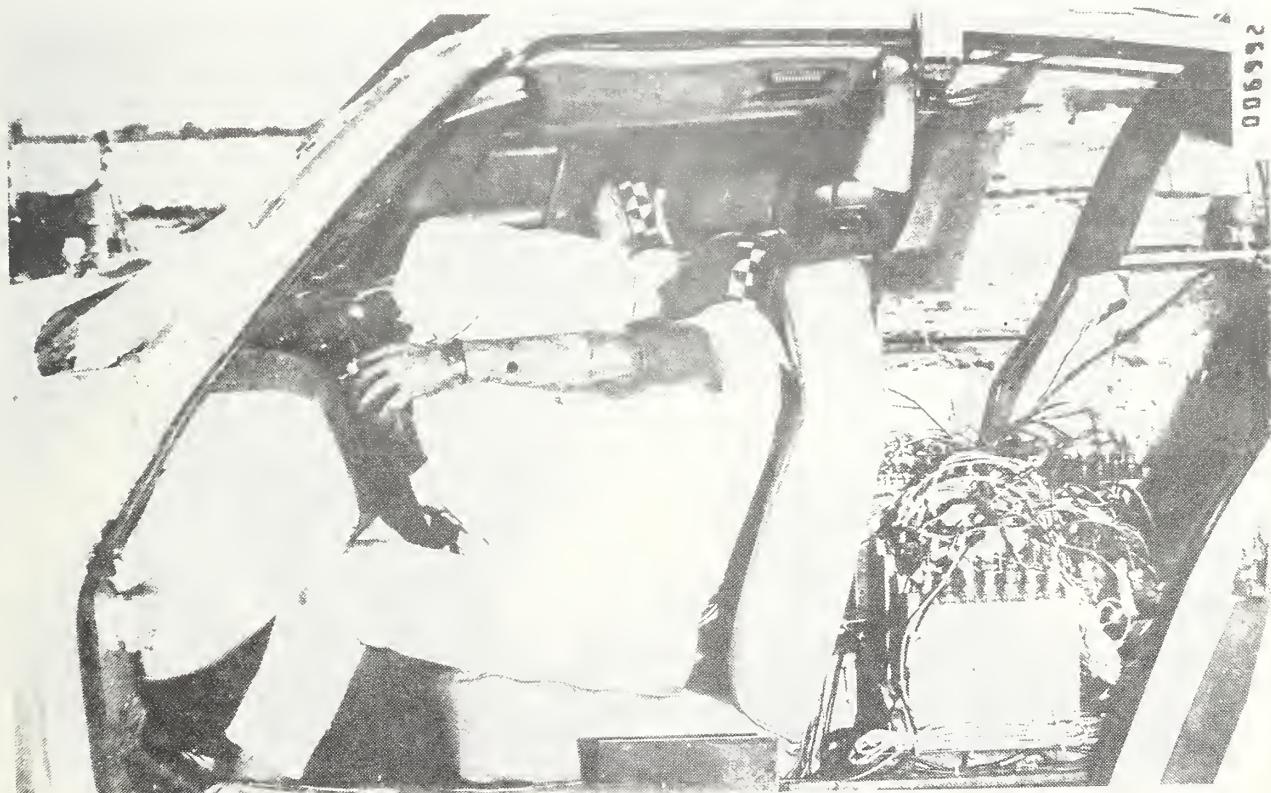
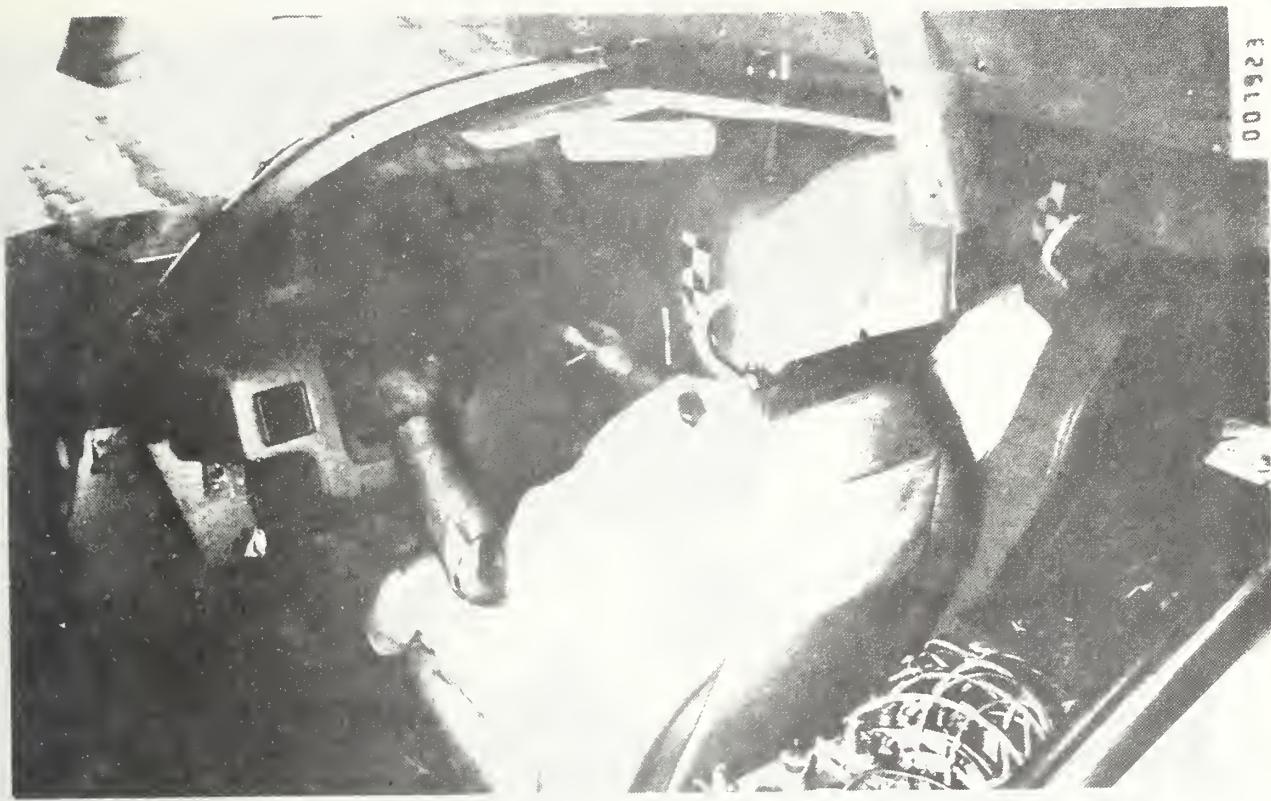


FIGURE 4-8. PRE- AND POST-TFST VIEW OF DRIVER DUMMY IN MINICARS RSV.

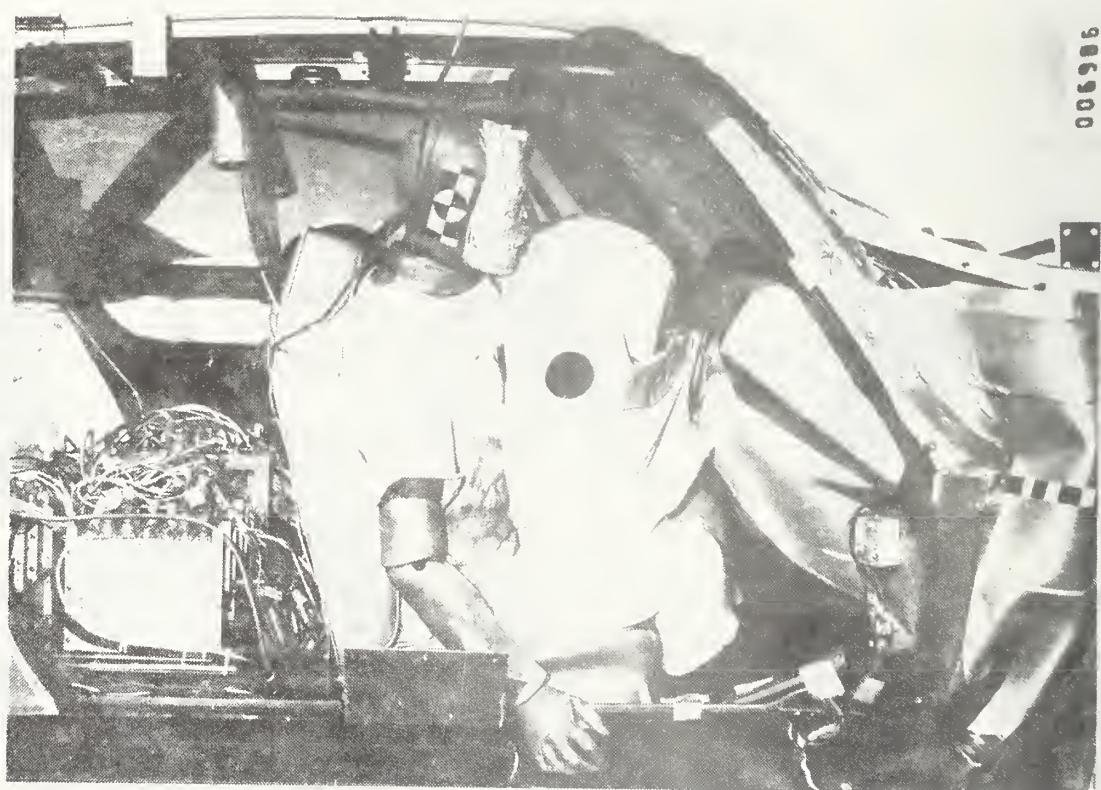


FIGURE 4-9. PRE- AND POST-TEST VIEW OF PASSENGER DUMMY IN MINICARS RSV.

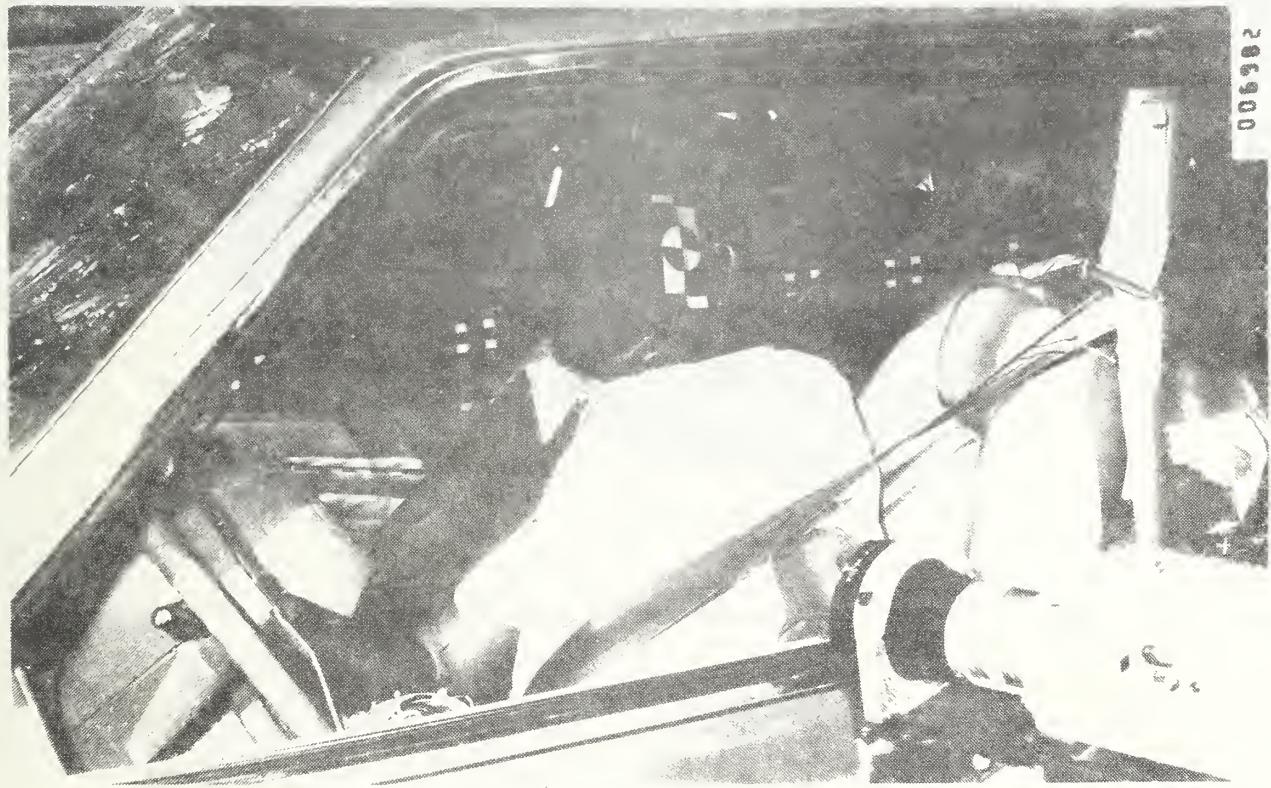
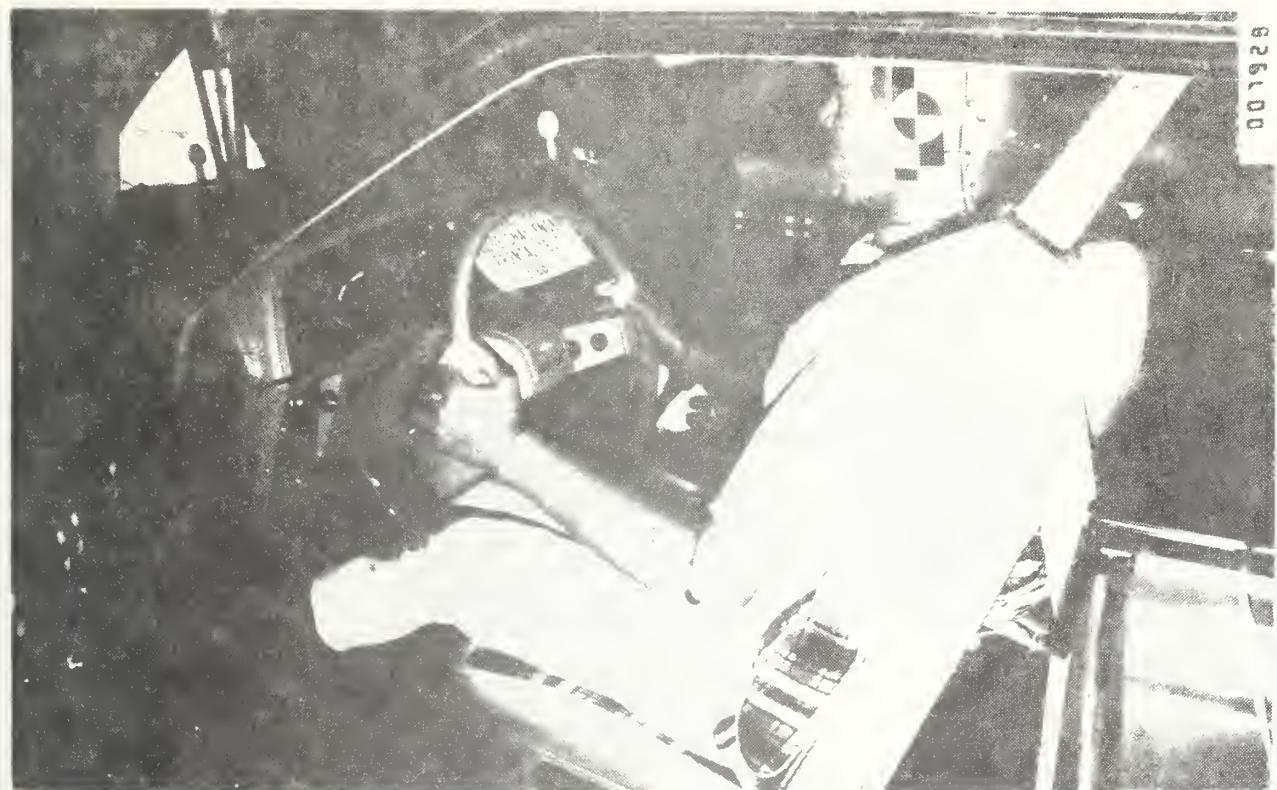


FIGURE 4-10. PRE- AND POST-TEST VIEW OF DRIVER DUMMY IN DODGE CHALLENGER.

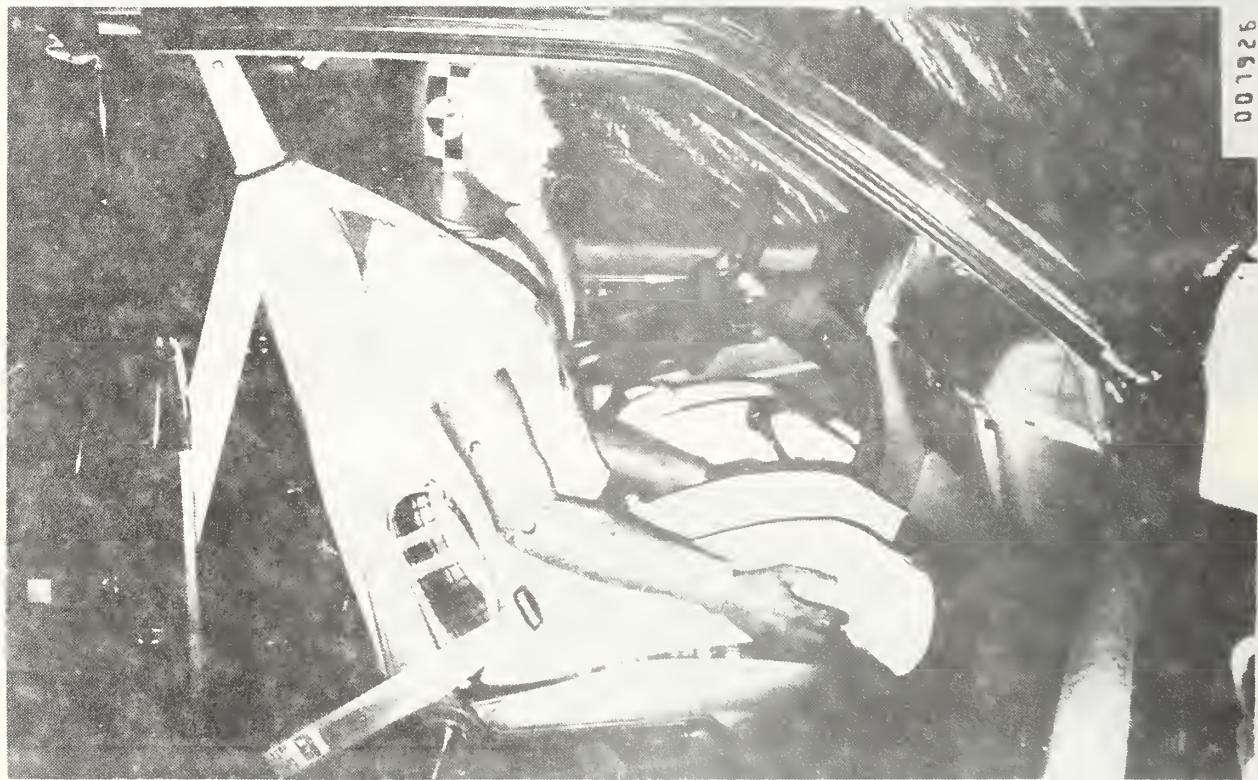


FIGURE 4-11A. PRE-TEST VIEW OF PASSENGER DUMMY IN DODGE CHALLENGER.

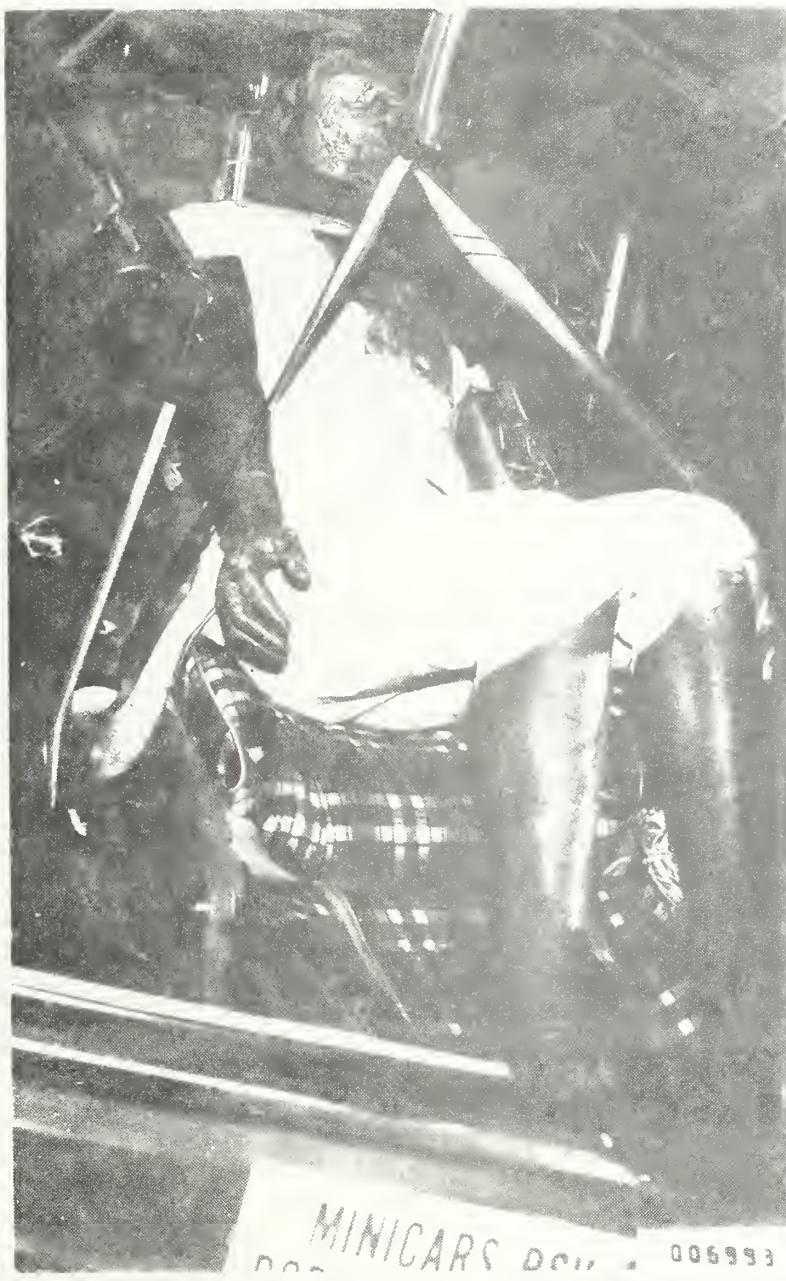


FIGURE 4-11B. POST-TEST VIEW OF PASSENGER DUMMY IN DODGE CHALLENGER.

FMVSS 208. During the crash event, the mounting rivets securing the lower door latching mechanism to the vehicle structure failed due to a fabrication defect causing the right door to open. This allowed the right hand of the passenger dummy to protrude momentarily outside the passenger compartment (see Figures 4-9 and 4-12). The door in these photographs was opened to facilitate the viewing of the final position of the dummy. The actual post-test position of the door is shown in Figure 4-2. High-speed films showed no other or greater protrusion or ejection of the dummy torso during the crash. There appeared to be no dummy head or chest contact with the vehicle interior. The chronology of crash events obtained from high-speed film analysis is presented in Table 4-12.

The driver and right front passenger in the Dodge Challenger were restrained by the production three-point belt system with emergency locking retractors (ELR). Both dummies exceeded the injury criteria levels for the head and chest as defined by FMVSS 208. The femur loads for both dummies appear to be well within the allowable FMVSS 208 load levels.

The driver dummy head and chest impacted the steering wheel rim and the neck contacted the steering wheel hub. The passenger dummy head (nose and chin area) contacted the upper surface of the dash panel.

Prior to the crash test, the dummies in the Minicars RSV were positioned in accordance with the recommended Minicars positioning procedure. The Dodge Challenger dummies were positioned to the current positioning procedure defined in the FMVSS 208 procedure provided by NHTSA. The initial positions of the dummies in both

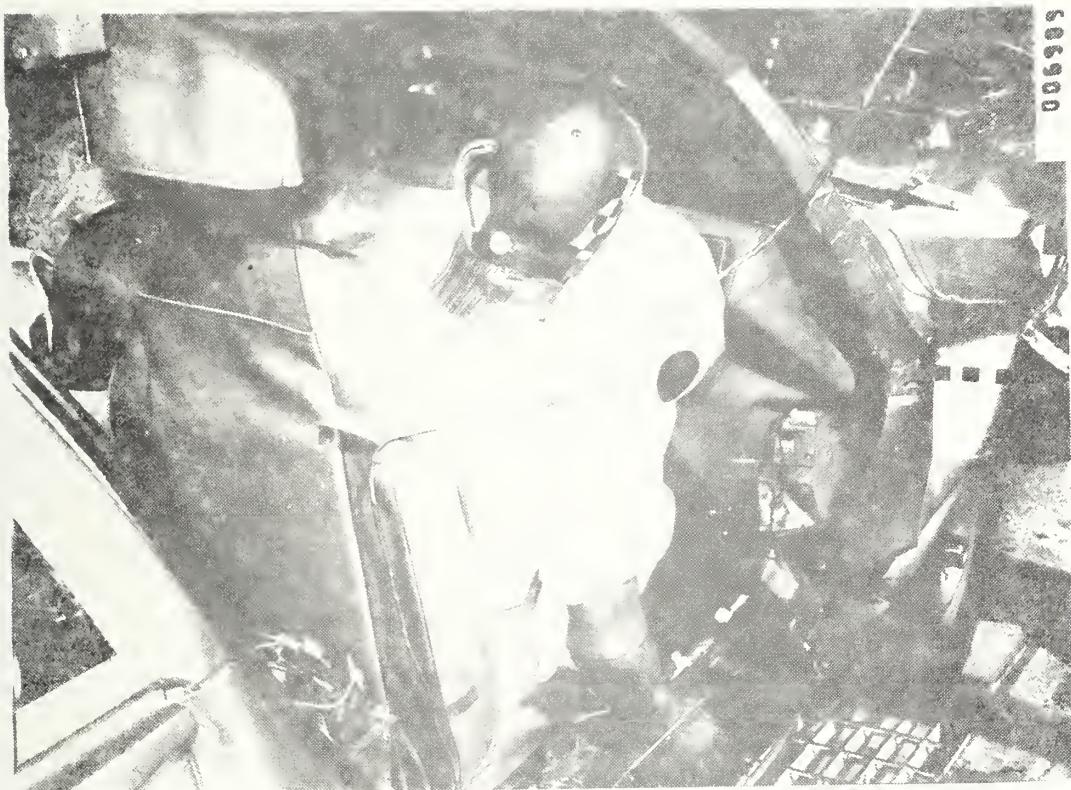


FIGURE 4-12. POST-TEST VIEW OF PASSENGER DUMMY IN MINICARS RSV

TABLE 4-12. FILM CHRONOLOGY OF CRASH EVENTS FOR MINICARS RSV M5-11 TO DODGE CHALLENGER FRONTAL ALIGNED IMPACT (TEST 3108-1)

Time (ms)	Event
0	Impact (visual).
2.5	Challenger hood and dash impact strobes fire.
7	RSV inboard strobe fires.
14	Challenger LF tire contacted by fender.
21	RSV Passenger air bag starts to deploy.
25	RSV hood starts to separate, RSV driver air bag starts to deploy.
27	RSV passenger air bag contacts dummy (stomach).
28	RSV passenger air bag contacts dummy (chest).
31	RSV RF tire contacted by fender.
34	RSV passenger air bag contacts dummy (chin), RSV hood completely separated from hinges.
40	Challenger front fenders push into tires, locking up wheels.
48	RSV driver air bag hits dummy chin, challenger steering wheel begins rearward intrusion.
51	RSV passenger air bag fully deployed, RSV passenger dummy full face contacts air bag.
53	Challenger tires hit RSV tires, RSV front wheels begin to crush rearward.
55	Challenger passenger dummy left knee hits dash.
58	Challenger passenger dummy right knee hits dash.
60	Challenger windshield begins to crack.
63	RSV driver dummy full face contacts air bag.
64	RSV driver air bag fully inflated, Challenger driver dummy chest hits steering wheel.
65	RSV RF tire hits front of passenger side door.
71	RSV passenger door starts to open, Challenger driver forehead hits steering wheel.
72	RSV windshield cracks.
77	Challenger driver neck contacts steering wheel hub.
85	Challenger passenger dummy's nose and chin contact dash.
88	Maximum forward motion of RSV driver's head.
89	Maximum Challenger steering wheel hub intrusion.
91	Maximum mutual dynamic crush.
94	Maximum Challenger driver's head forward motion.
96	RSV passenger side door window shatters.
101	Vehicles begin to rebound.
103	Maximum Challenger passenger's head forward motion.
186	Challenger passenger head contacts seat on rebound.
221	Challenger passenger seat back latch fails.
486	Challenger passenger's head hits rear deck area.
718	RSV passenger side door fully open.

cars were measured and are documented in Figure 4-13 (Minicars RSV) and Tables 4-13 and 4-14 (Dodge Challenger).

4.3 SUMMARY AND CONCLUSIONS

The primary objective of this test was to determine the vehicle crashworthiness and occupant response of the Minicars RSV and similar size current production vehicle in a frontal car-to-car impact.

The following factors were used to compare the vehicle crashworthiness and occupant response to the crash event.

- Occupant compartment peak acceleration and velocity change
- Occupant compartment intrusion
- Restraint system performance

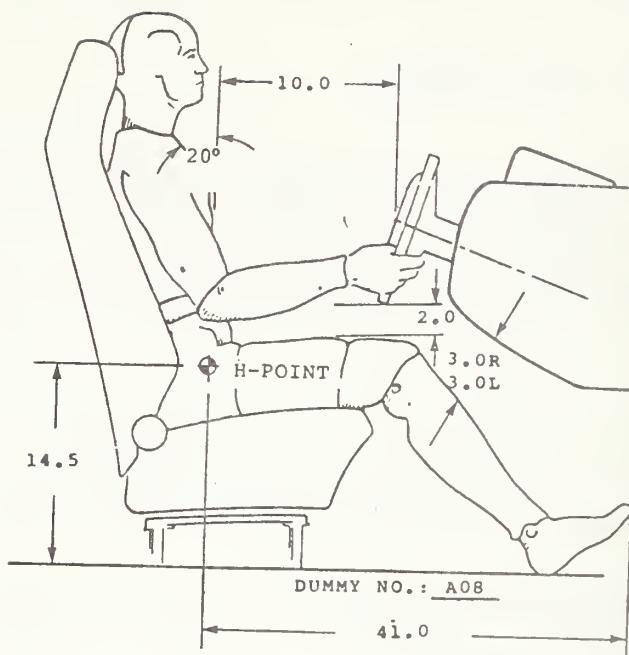
The test results show similar occupant compartment peak accelerations (37-39 g's) for both vehicles. However, the RSV and Dodge Challenger velocity change during the crash event was 46.4 mph (see velocity plot of RSV locations 12 and 13 averaged) and 51.1 mph (see velocity plot of Dodge locations 3 and 4 averaged), respectively.

The occupant compartment intrusion in the RSV was well maintained with moderate toe-board and floor pan deformation. The Challenger forward compartment and steering column intrusion was quite severe.

DIMENSIONS IN INCHES

DRIVER DUMMY

8G3108 54 00801



PASSENGER DUMMY

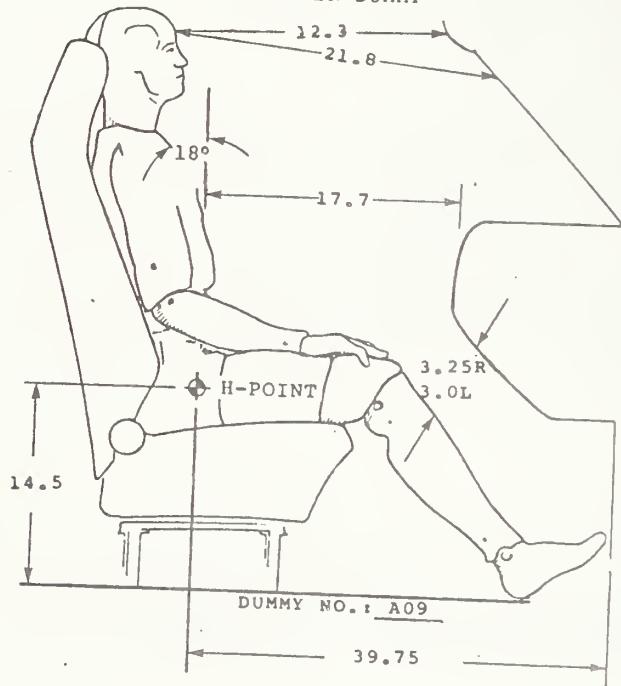


FIGURE 4-13. MINICARS RSV M5-11 PRE-TEST DUMMY POSITIONS (TEST 3108-1).

TABLE 4-13. DODGE CHALLENGER DUMMY POSITIONING (TEST 3108-1)

<u>Measurement</u>	<u>Pre-test Dummy Position</u>	
	<u>Driver (in.)</u>	<u>Passenger (in.)</u>
Dummy Centerline to Vehicle Centerline	13.0	14.0
Nose to Upper Rim Steering Wheel	17.0	N/A
Nose to Windshield (Horizontal Distance)	17.3	16.7
Left Knee to Closest Point on Lower Panel	6.3 to dash 4.4 to column	5.0
Right Knee to Closest Point on Lower Panel	6.5 to dash 4.3 to column	5.5
Ankle Distance	10 inches	10
Knee Distance	9 inches	9
Head to Windshield Header	12.2	11.2
Chest to Dash	22.2	19.6
Chest to Steering Wheel	12.5	N/A
Head to Side Header	4.7	4.5
Arm to Door	3.0	3.4
Hip to Door	4.3	4.8

Additional dummy positioning information is presented in the PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET which follows.

TABLE 4-14. PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET (TEST 3108-1)

NHTSA No.: (R&D) Manufacturer: Mitsubishi Motors Corp

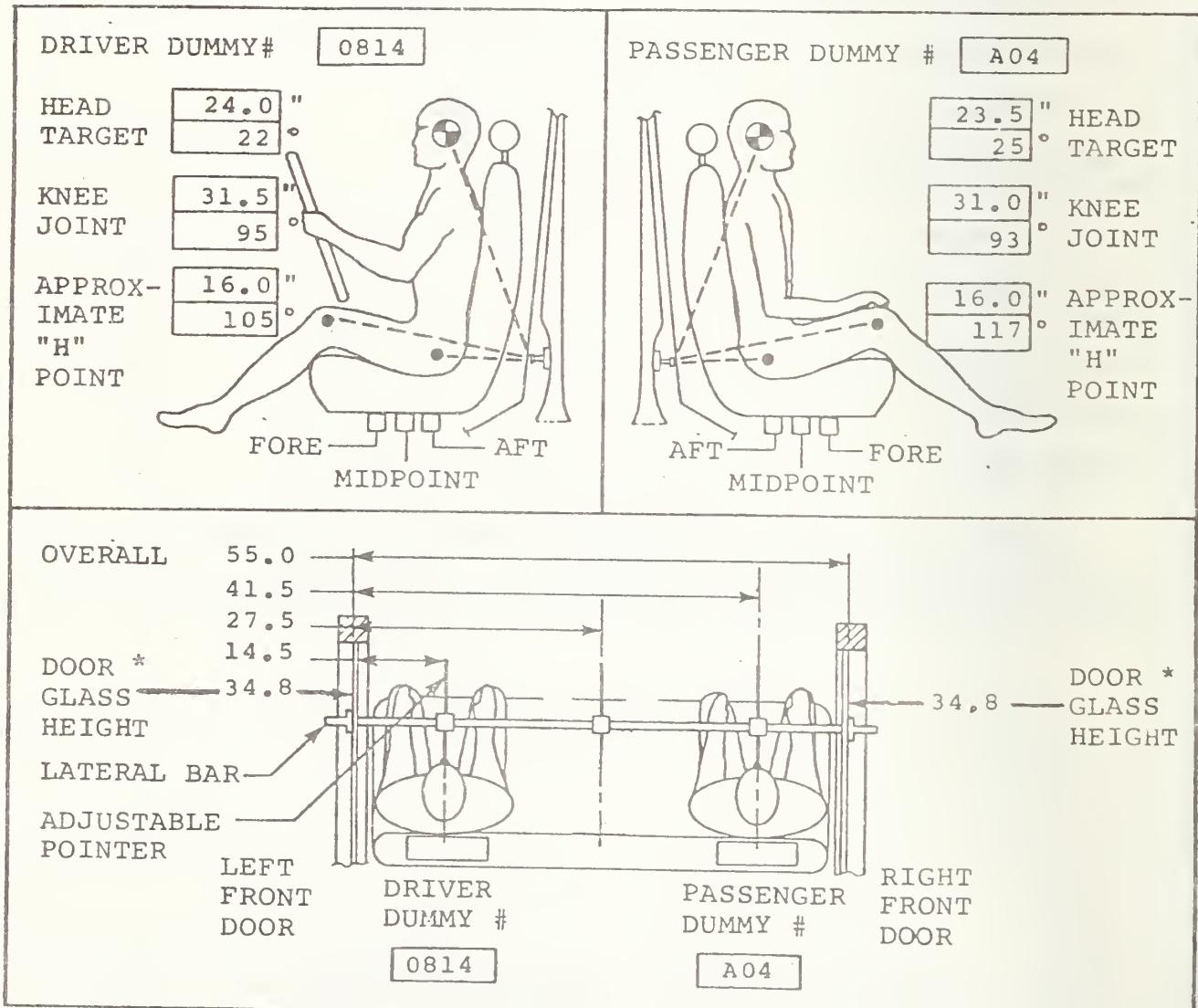
Make/Model: Dodge Challenger Model Year: 1979

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>BUCKET SEAT BACK TYPE:</u>
<input type="checkbox"/> Bench	<input checked="" type="checkbox"/> Manual	<input checked="" type="checkbox"/> Adjustable
<input checked="" type="checkbox"/> Bucket	<input type="checkbox"/> Power	<input type="checkbox"/> Reclining
<input type="checkbox"/> Split Bench		<input type="checkbox"/> Fixed

AMBIENT TEMPERATURE: 89 °F; TIME: 11:00 AM

POSITION DATE: 9/10/80 TECHNICIANS: 1. Terry Bjork
2. Mark Pozzi

All front seat dummies are positioned according to the procedure
"OSE RECOMMENDED PROCEDURE FOR POSITIONING PART 572 DUMMIES IN
TEST VEHICLE."



*Door glass height is equal on the right and left side of vehicle.

The comparison of the restraint system performance is quite apparent in that there was no contact of either of the dummies in the RSV with the vehicle interior. Both dummies in the Challenger severely impacted the forward occupant compartment. Further evidence of the restraint system performance is shown by the much lower occupant injury criteria for the RSV compared to the Dodge Challenger (see Tables 4-10 and 4-11).

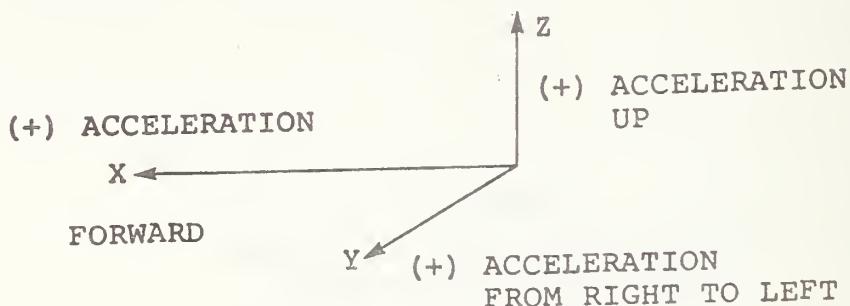
It is apparent from the above documentation that the RSV frontal structure and restraint system response was quite satisfactorily compared to the Dodge Challenger.

APPENDIX A

MINICARS RSV M5-11 OCCUPANT
AND VEHICLE DATA PLOTS

The sign convention used on this test is presented below:

(1) Vehicle and dummy accelerations



(Minicars Sign Convention)

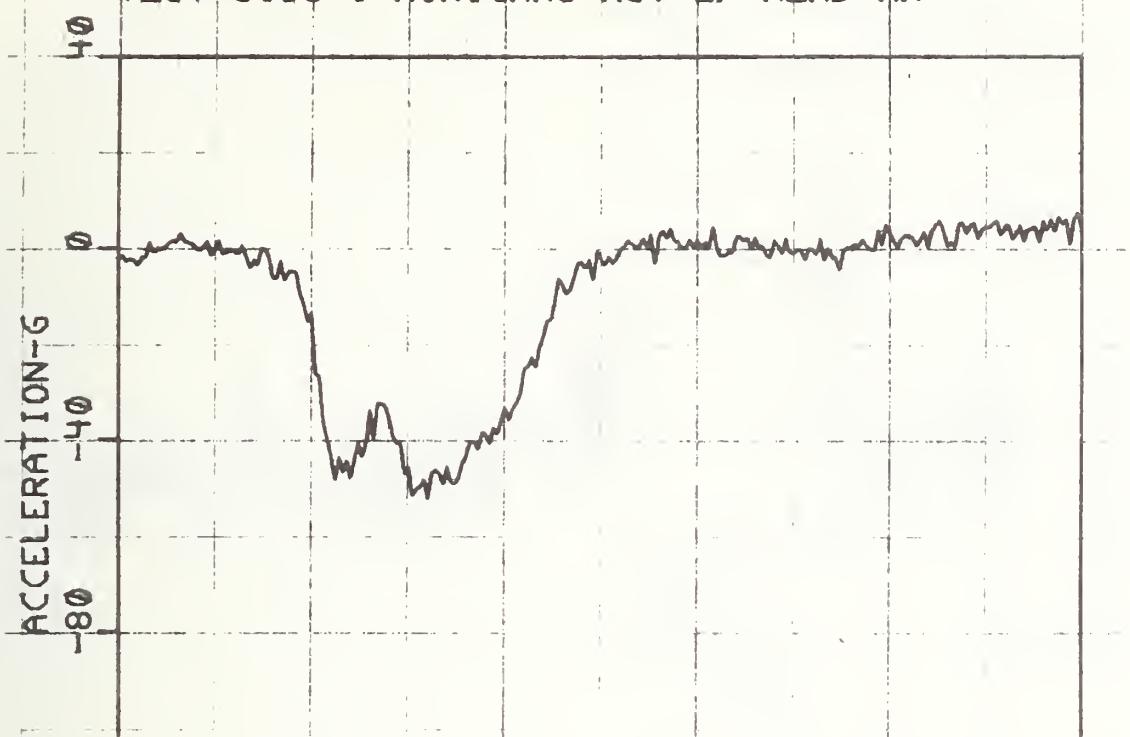
(2) Velocity and displacement agree with the above convention.

NOTE: All Y and Z channel data was reversed in polarity in order to conform with the above sign convention used by Minicars.

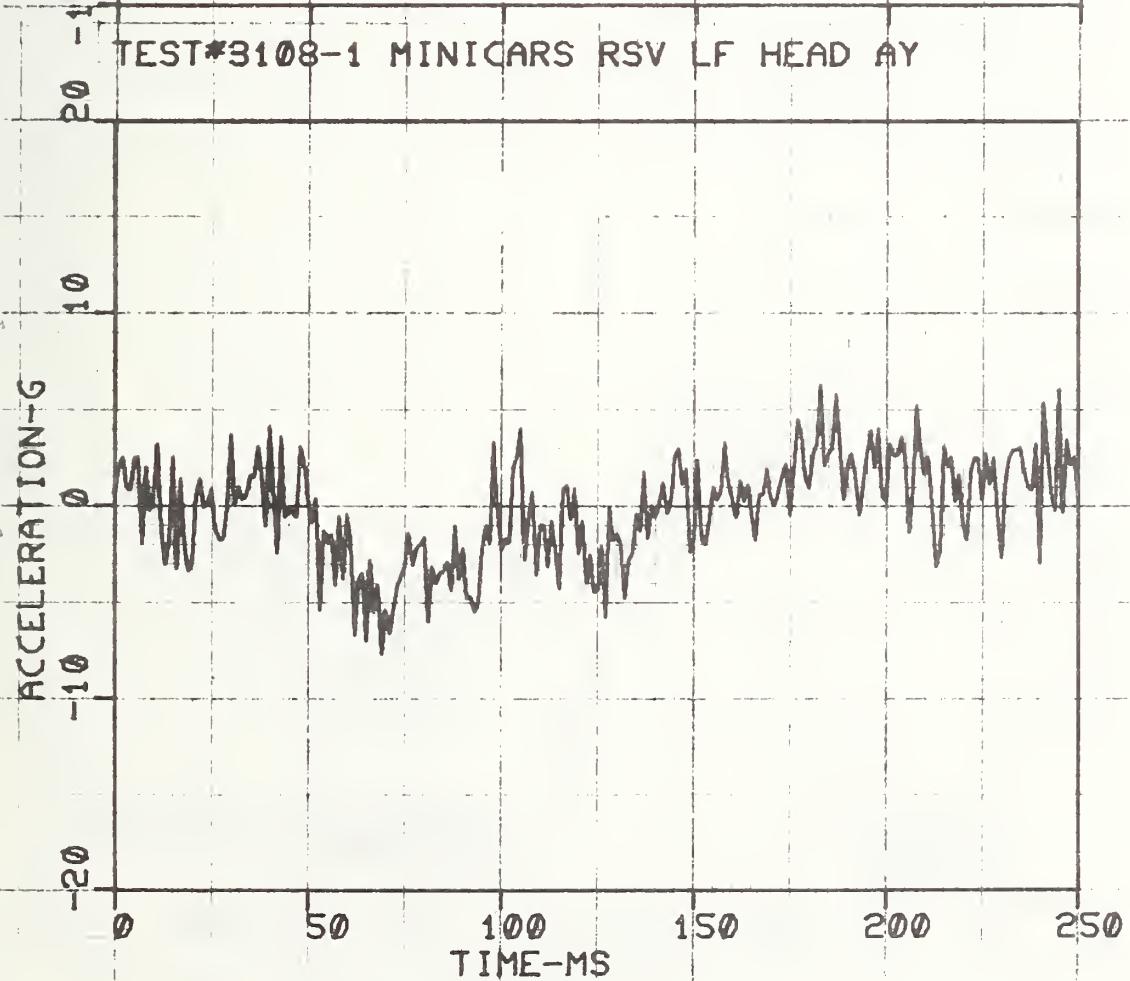
Data filtered per SAE recommended practice J211b as follows:

<u>Test Measurement</u>	<u>Channel Class</u>
Dummy Head	1000
Dummy Chest	180
Dummy Pelvis	180
Dummy Femurs	600
Vehicle Structure	60

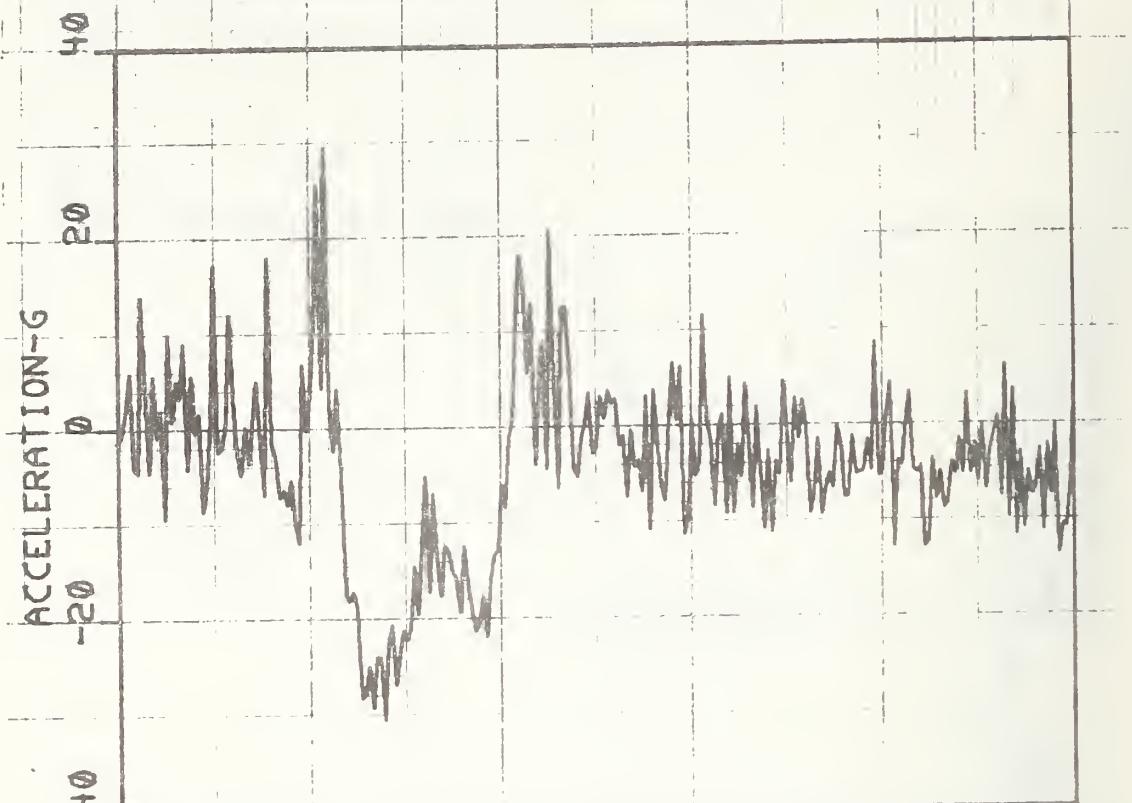
TEST#3108-1 MINICARS RSV LF HEAD AX



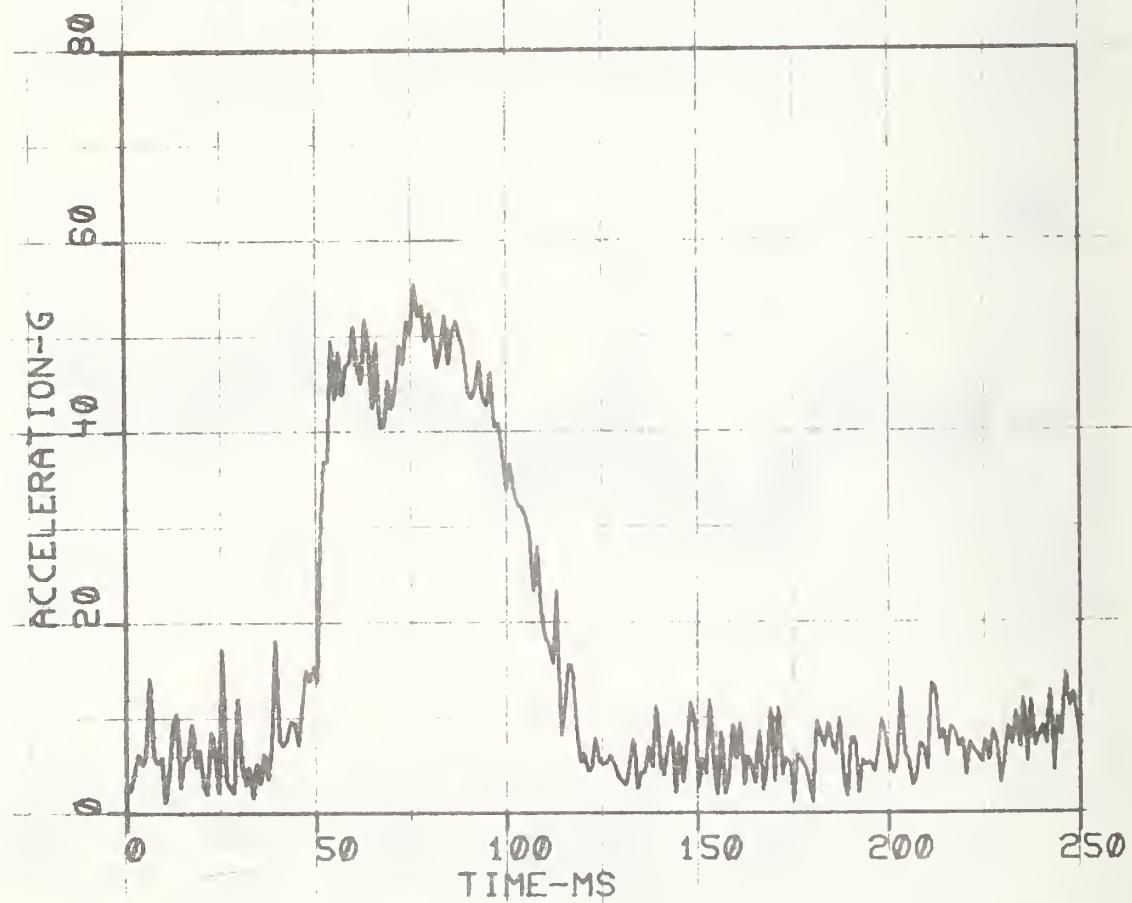
TEST#3108-1 MINICARS RSV LF HEAD AY



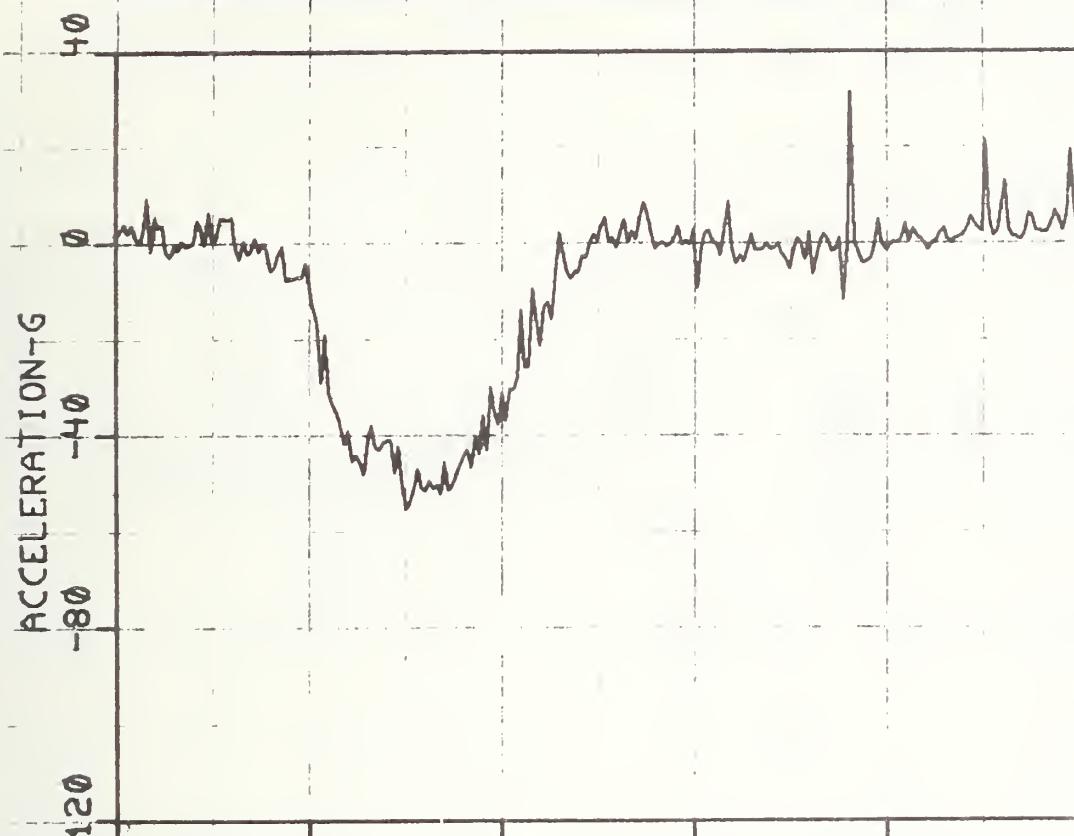
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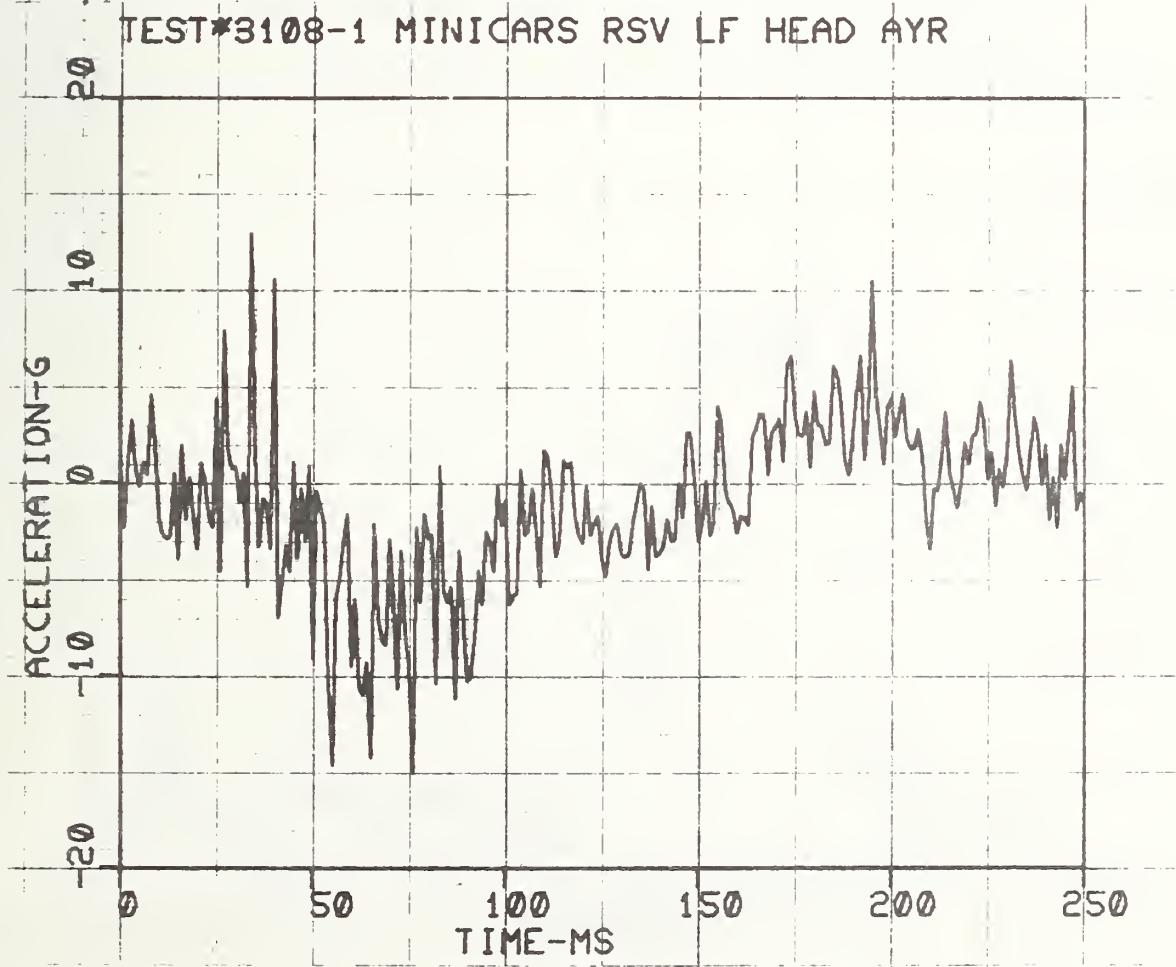
TEST#3108-1 MINICARS RSV LF HEAD AR



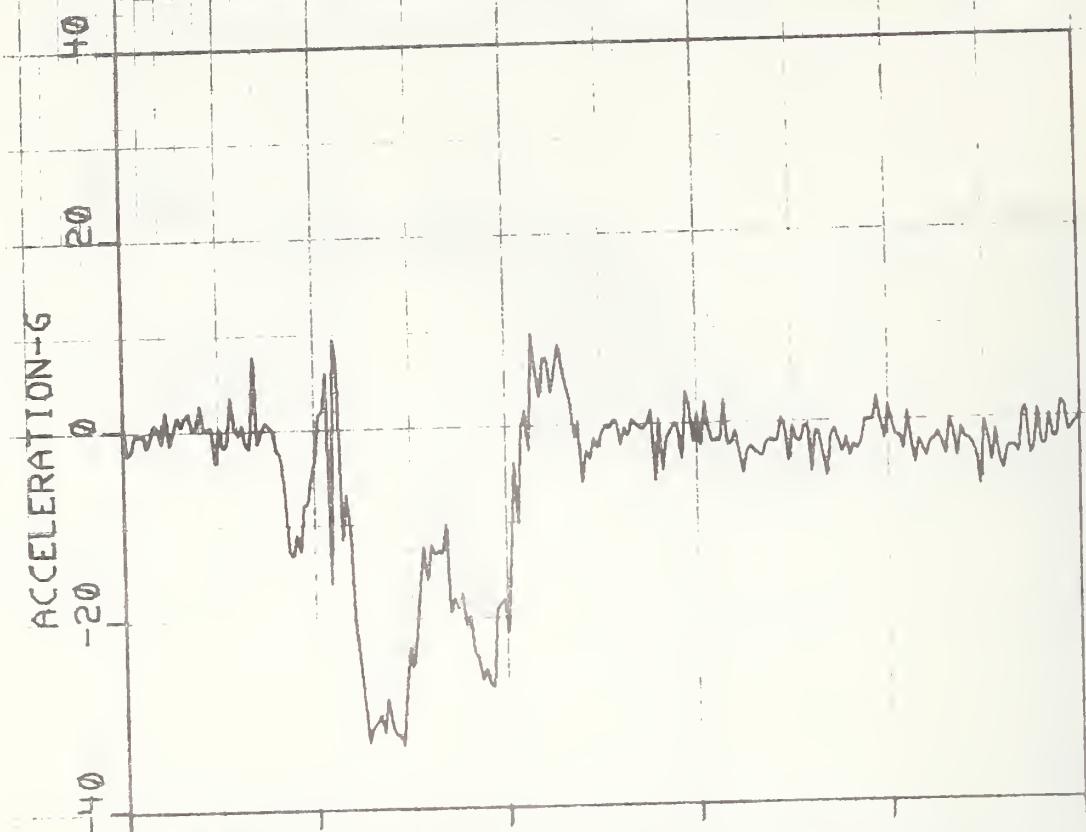
TEST#3108-1 MINICARS RSV LF HEAD ARX



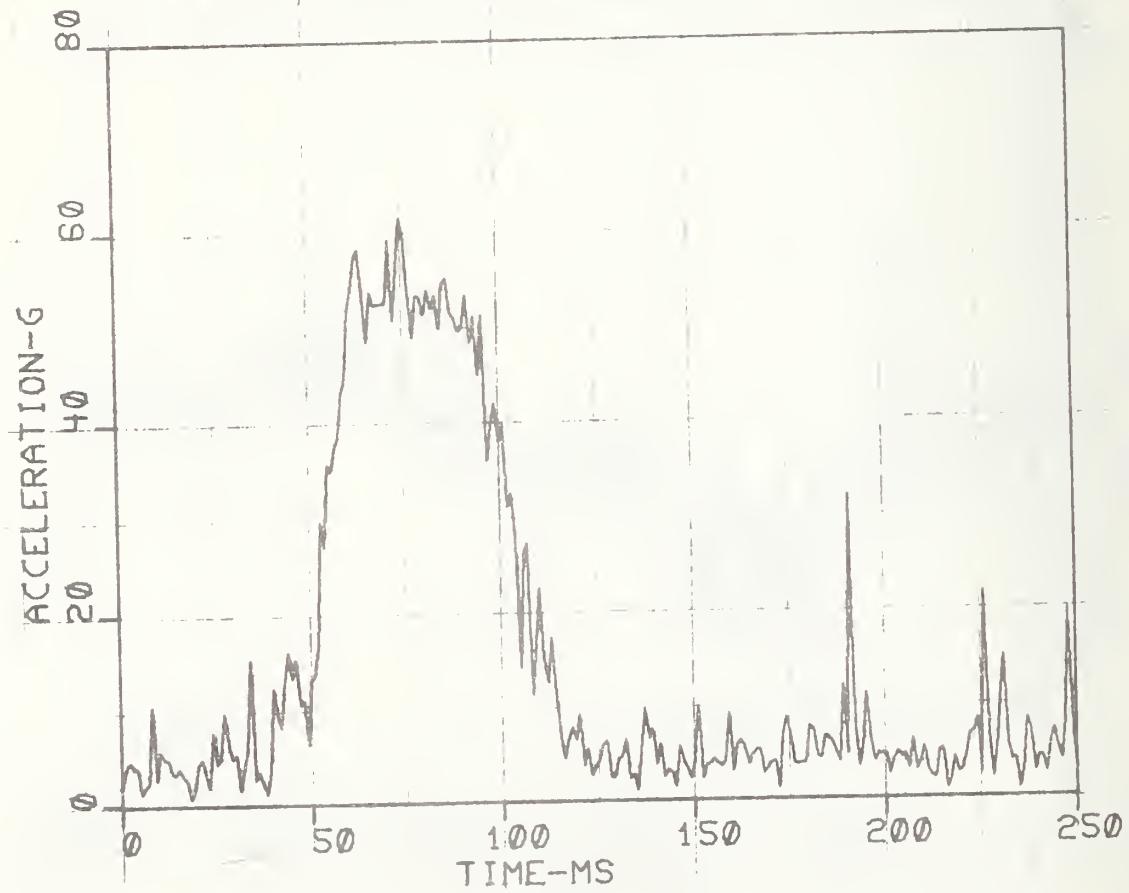
TEST#3108-1 MINICARS RSV LF HEAD AYR



TEST#3108-1 MINICARS RSV LF HEAD ARZ



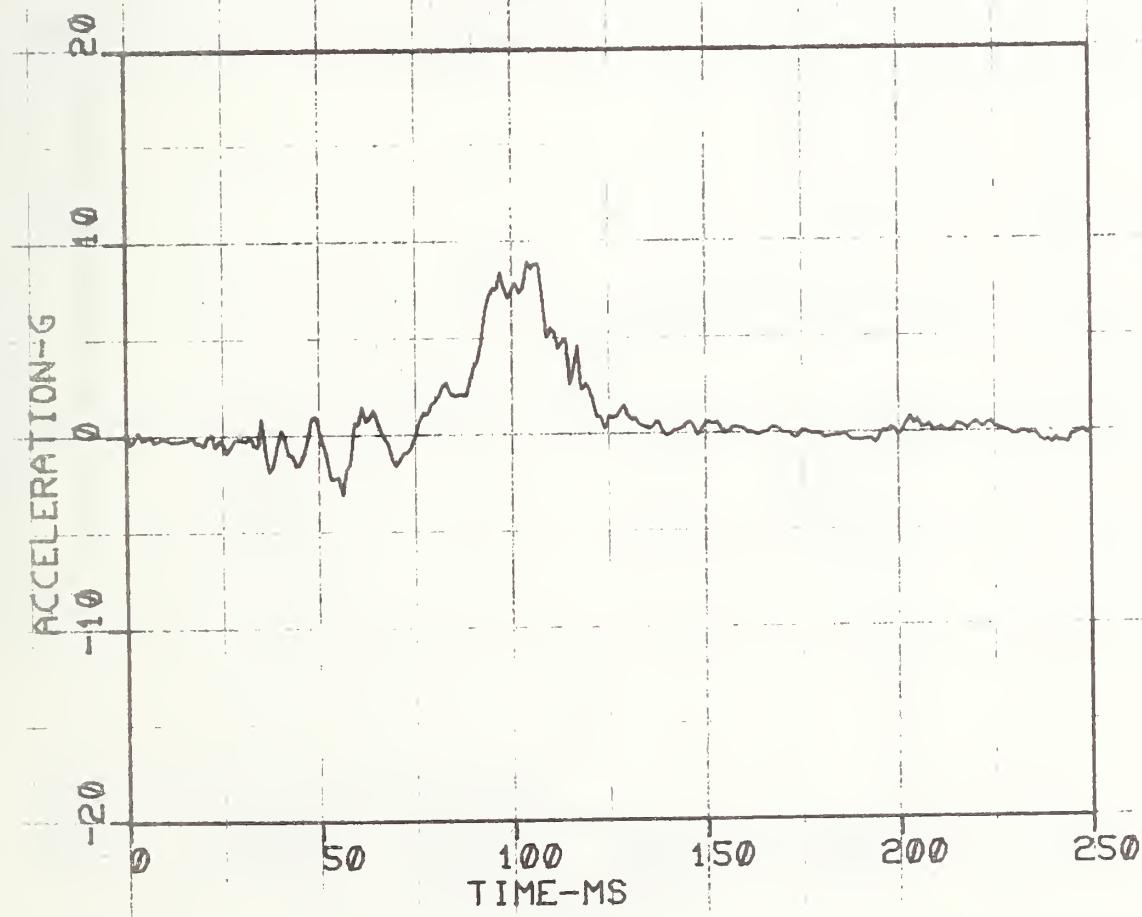
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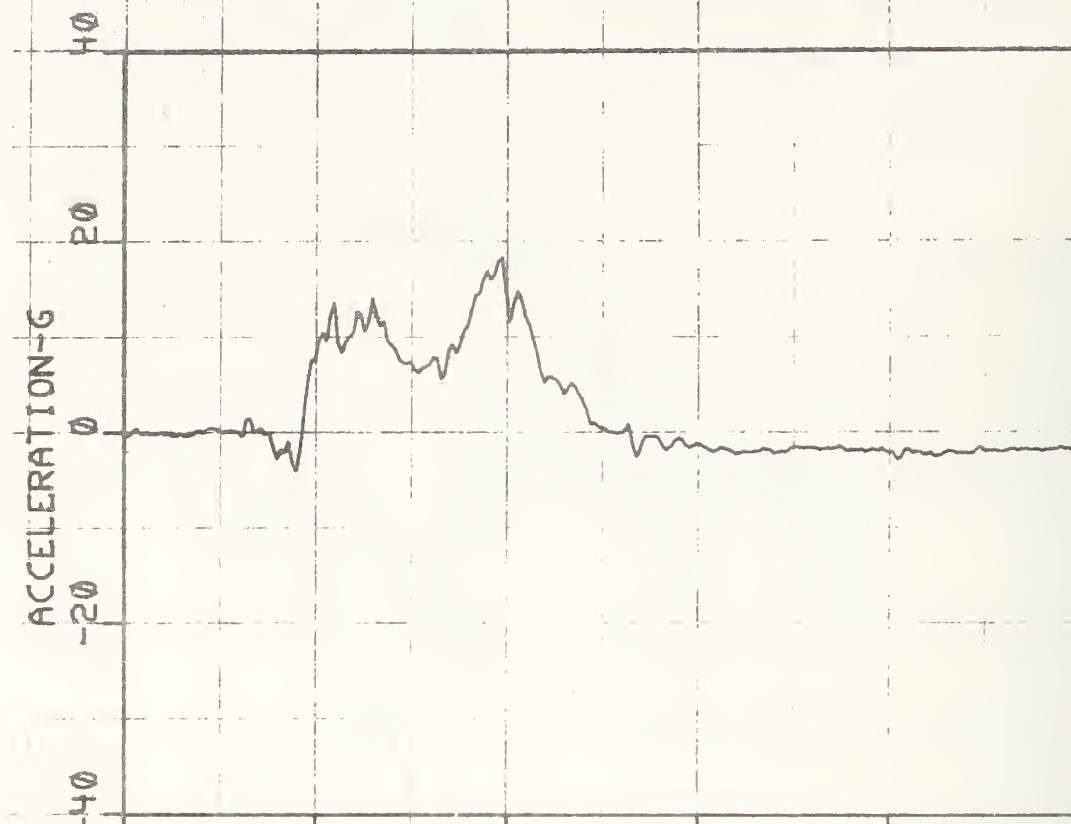
TEST#3108-1 MINICARS RSV LF CHEST AX



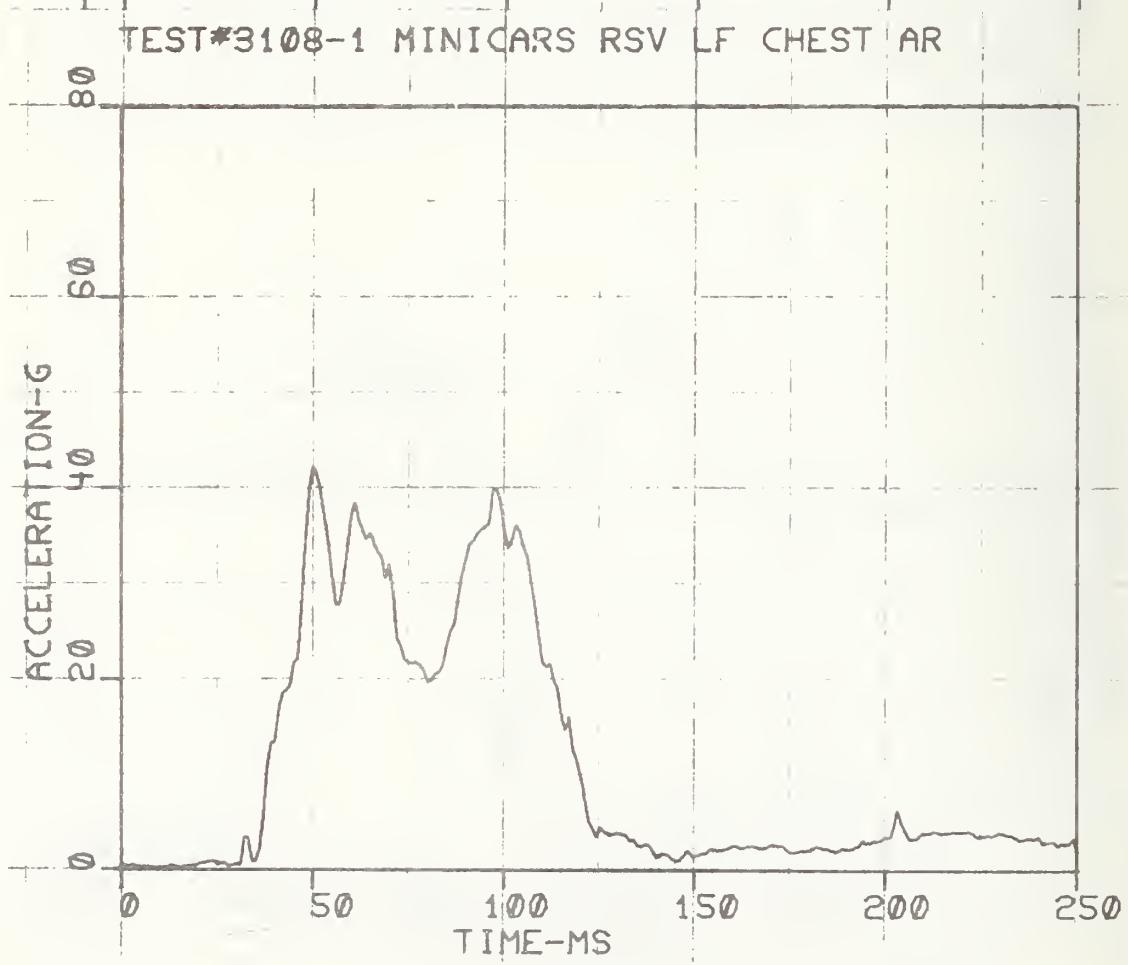
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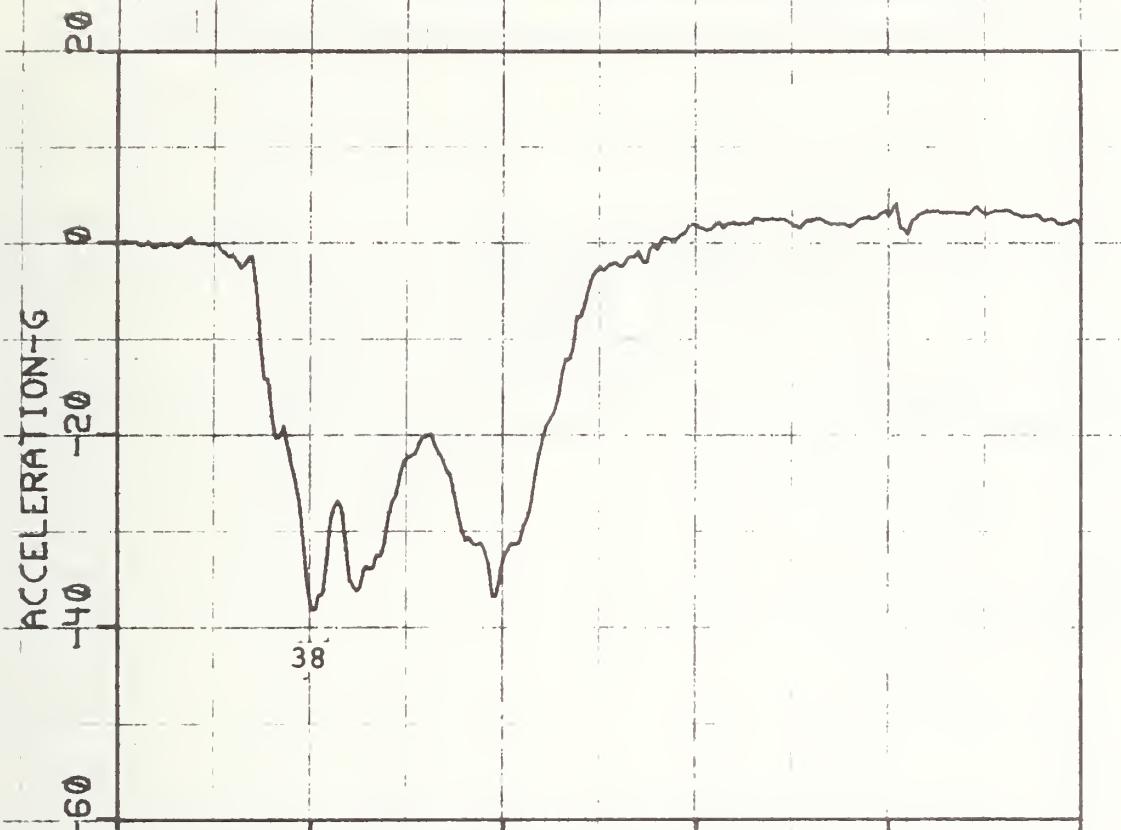
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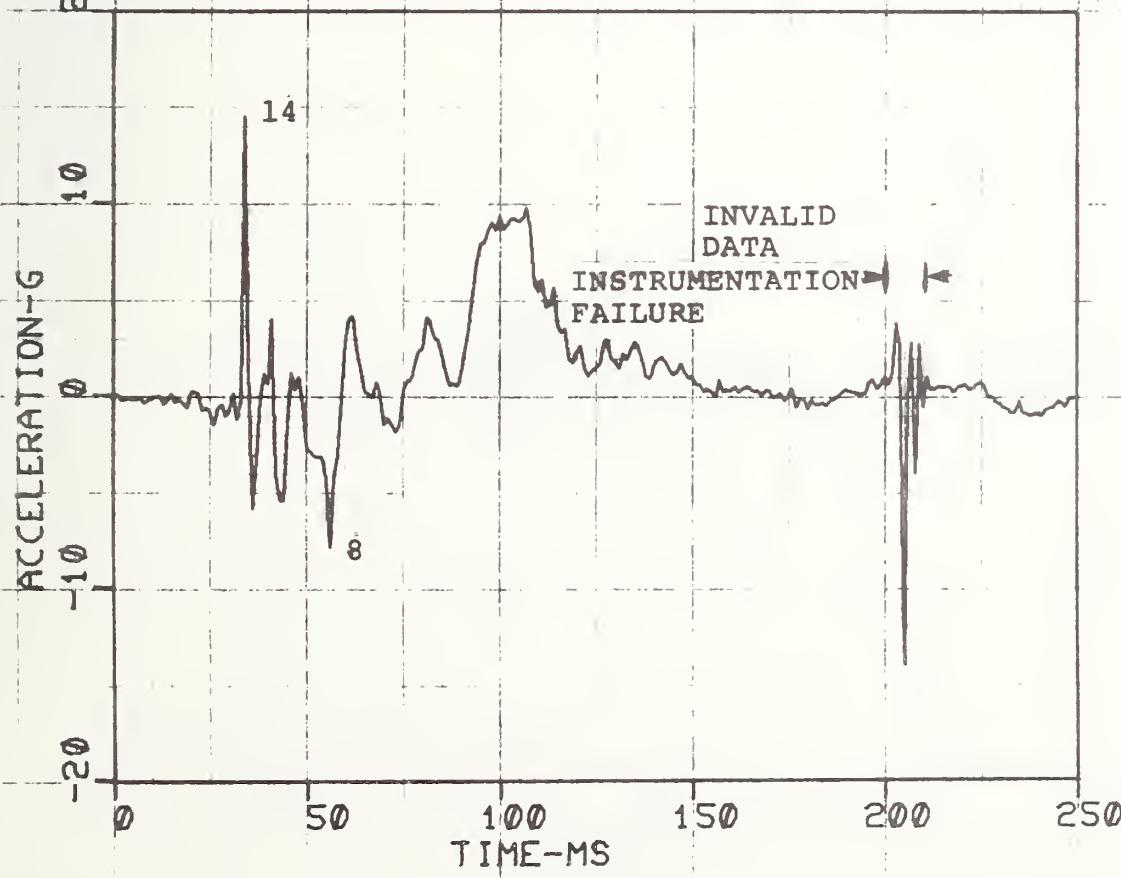
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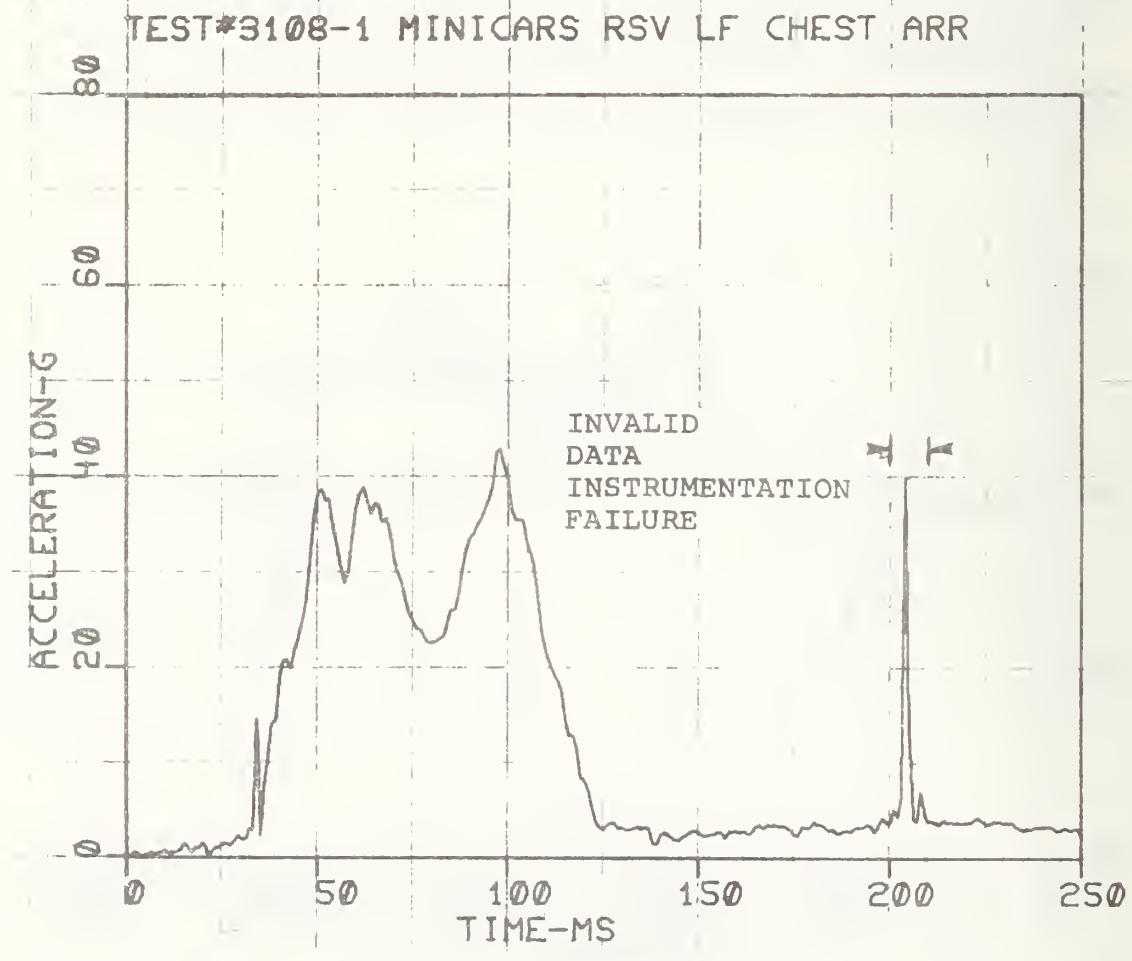
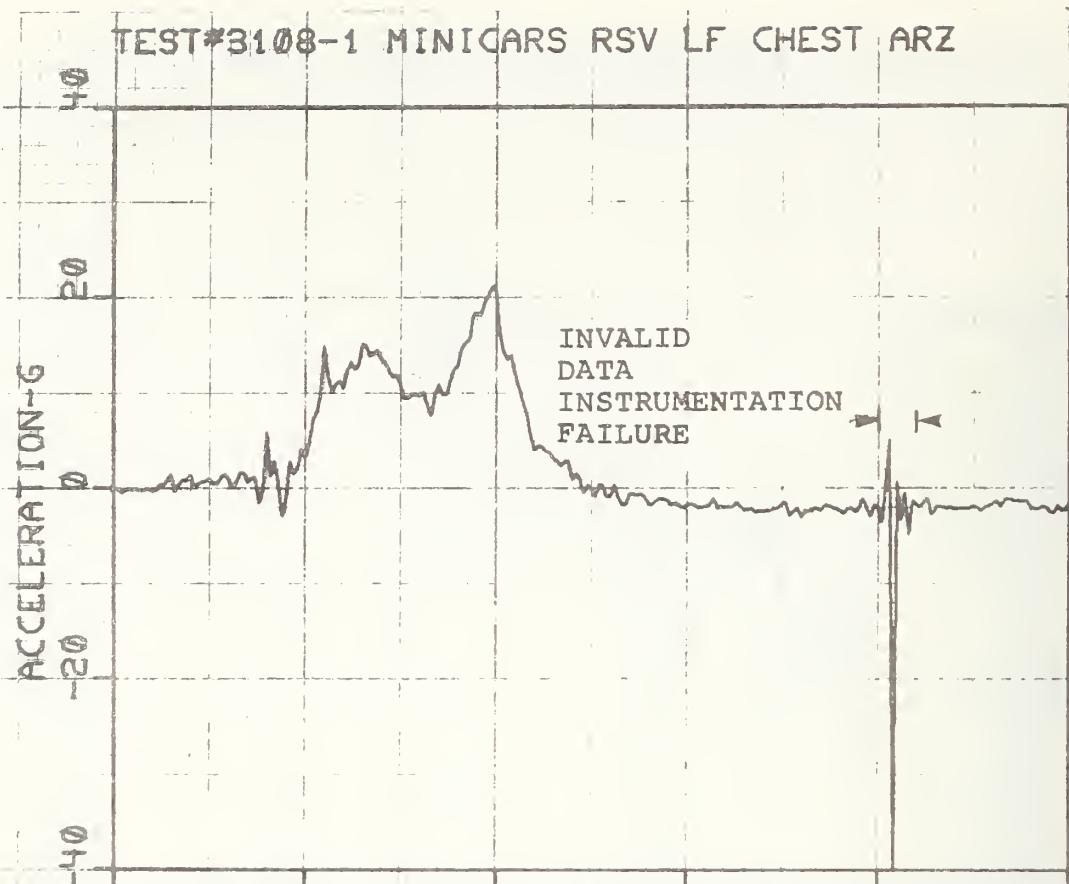


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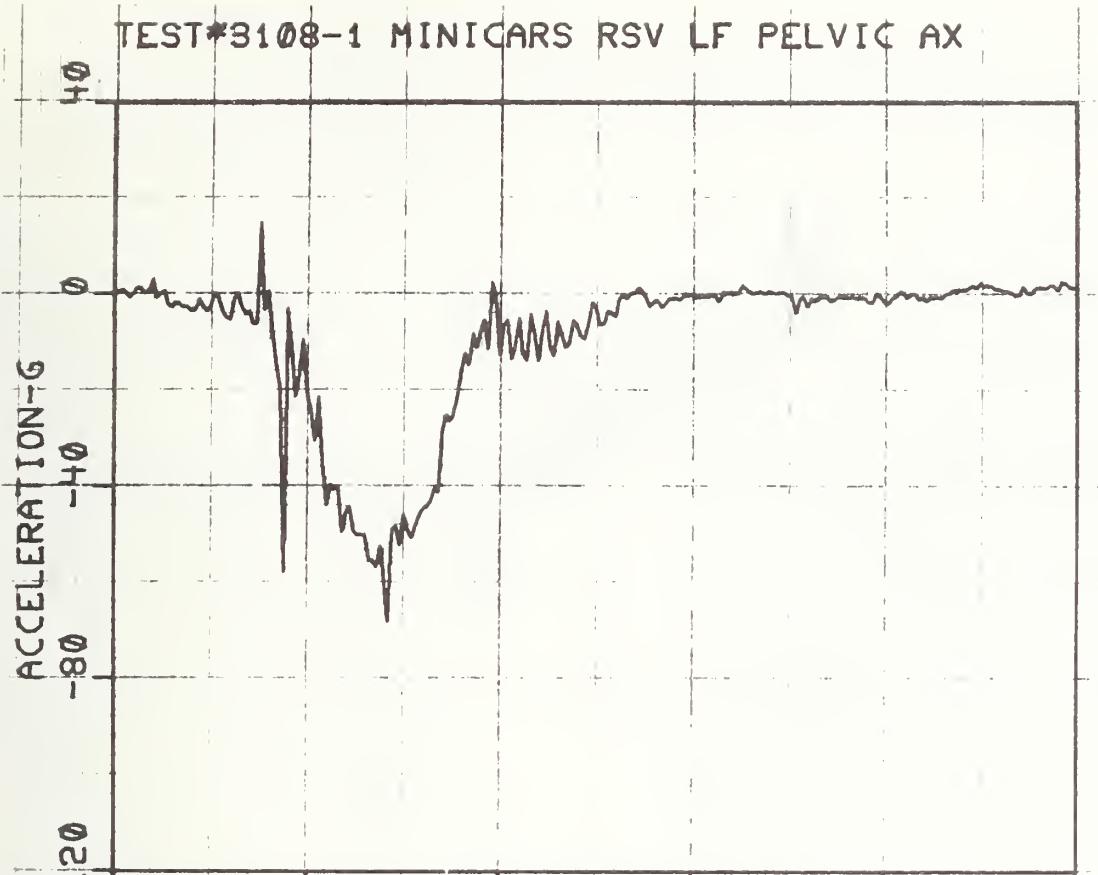


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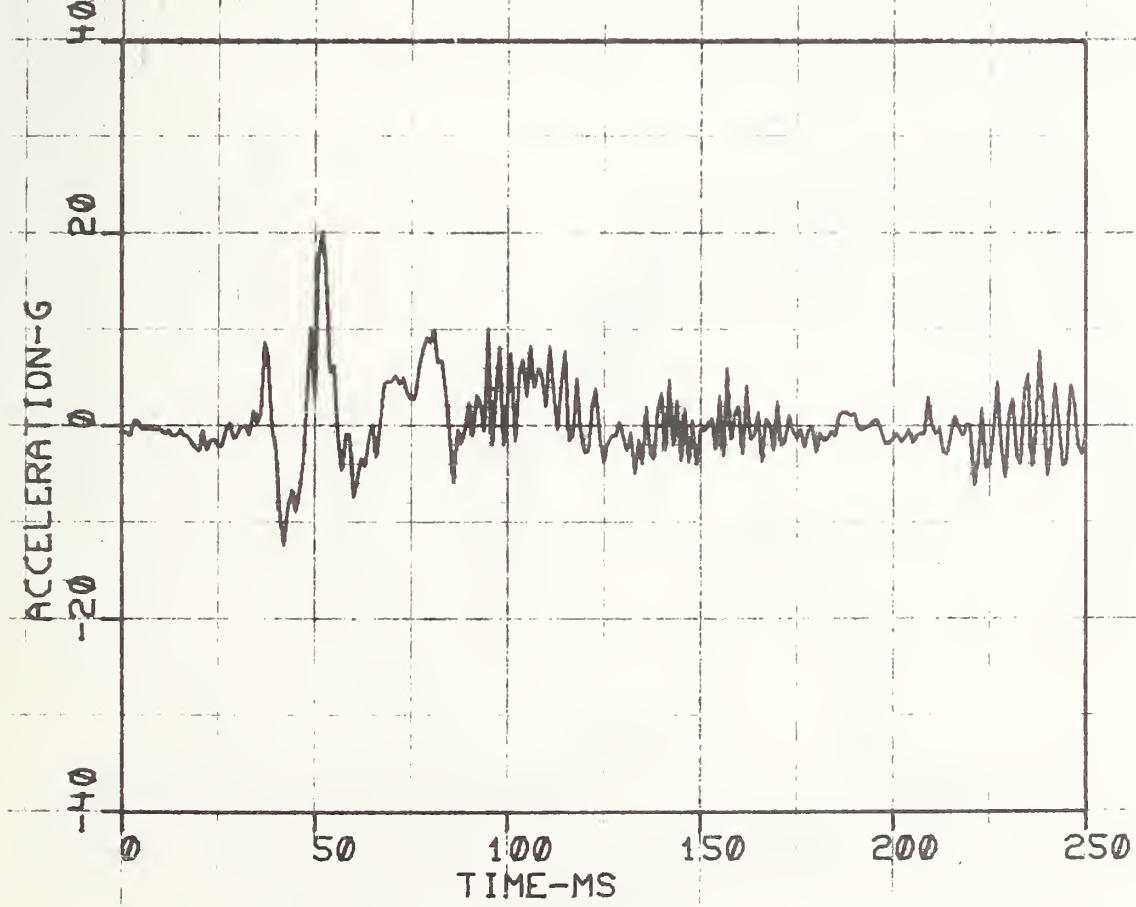




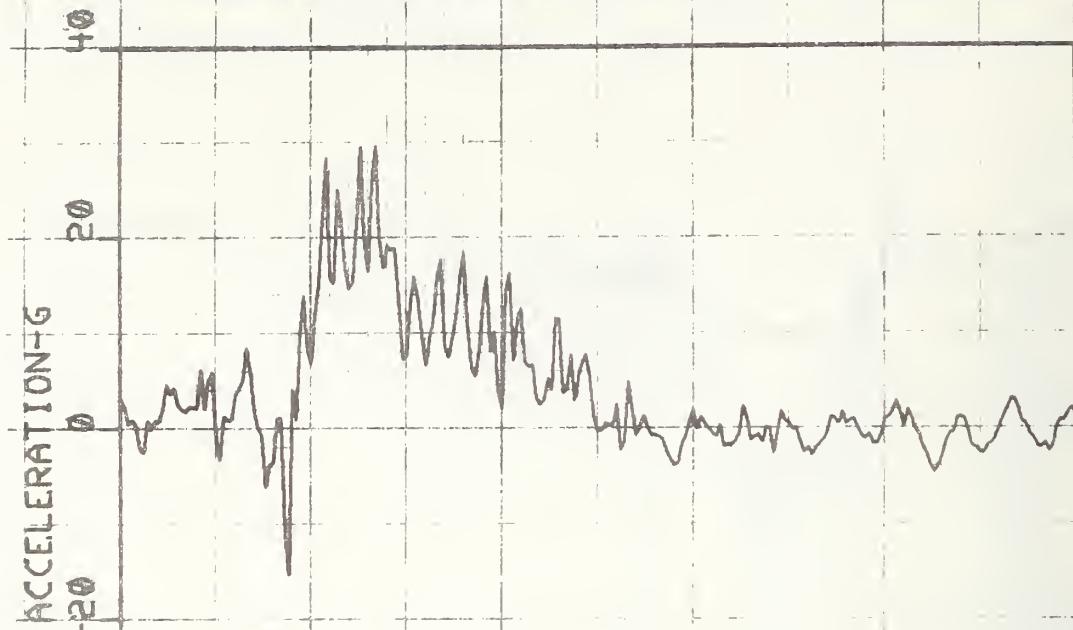
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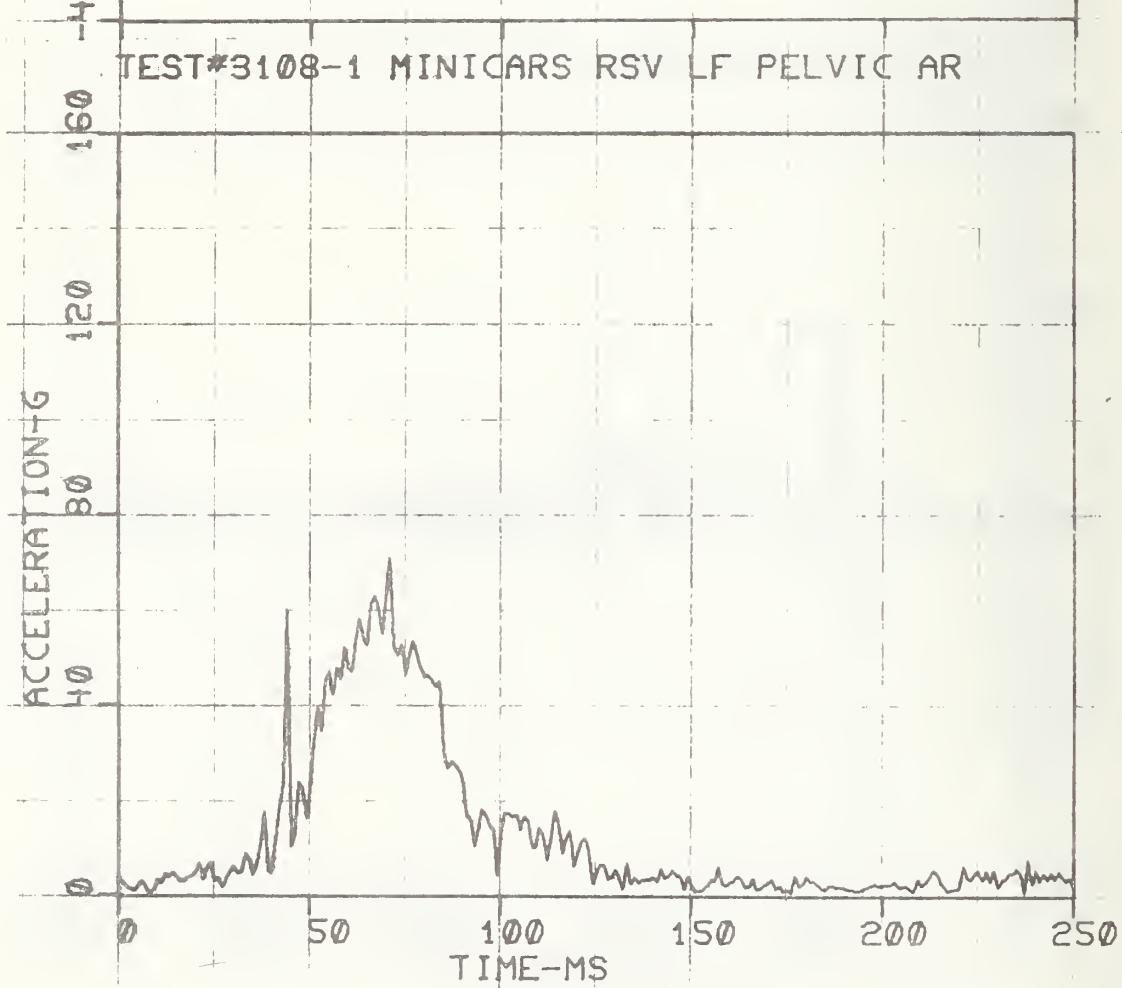
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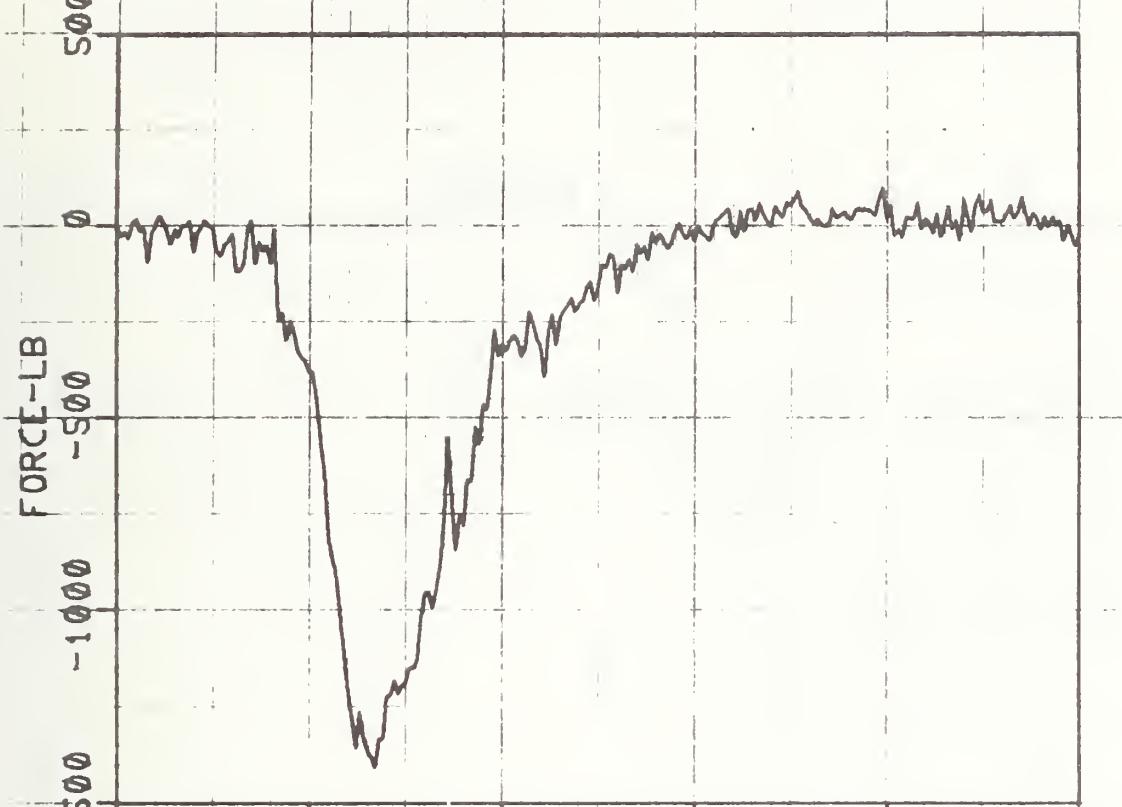
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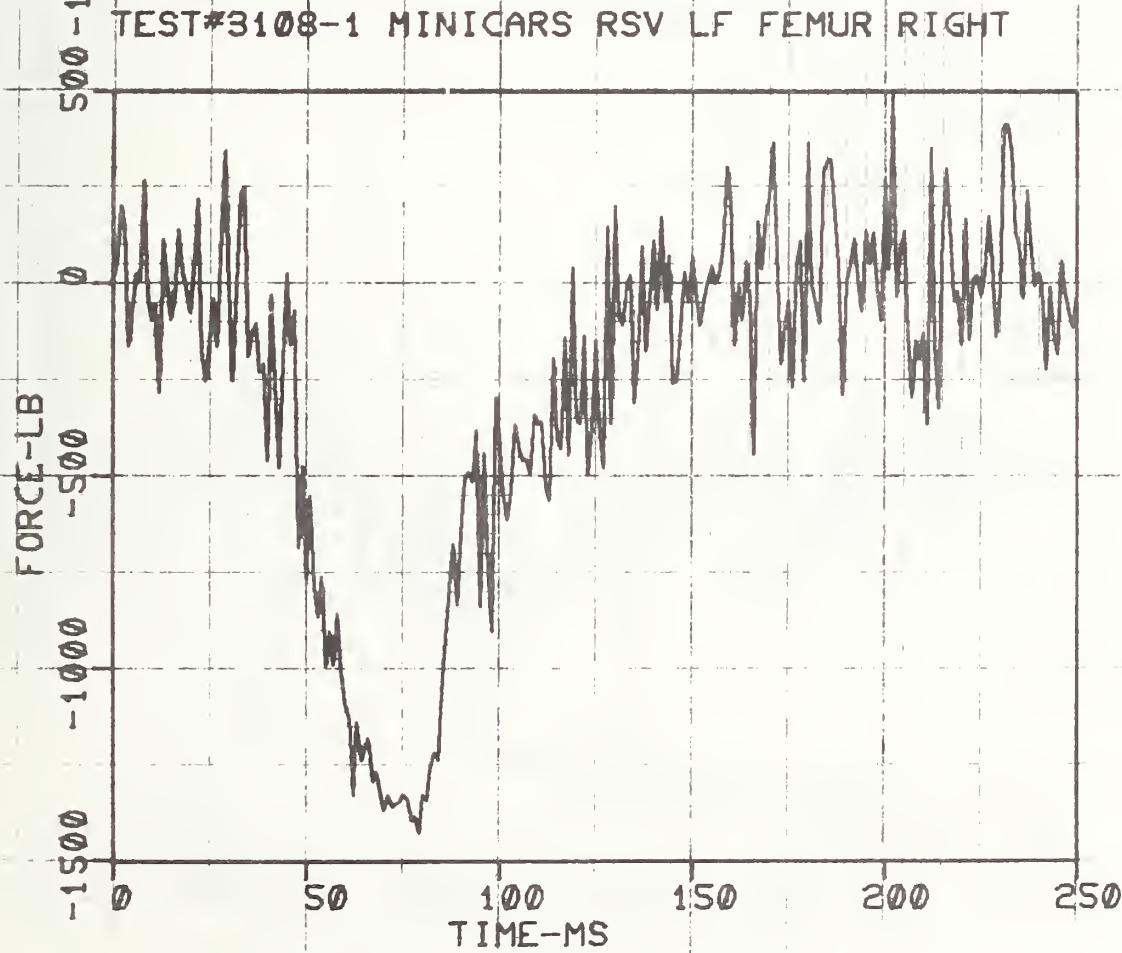
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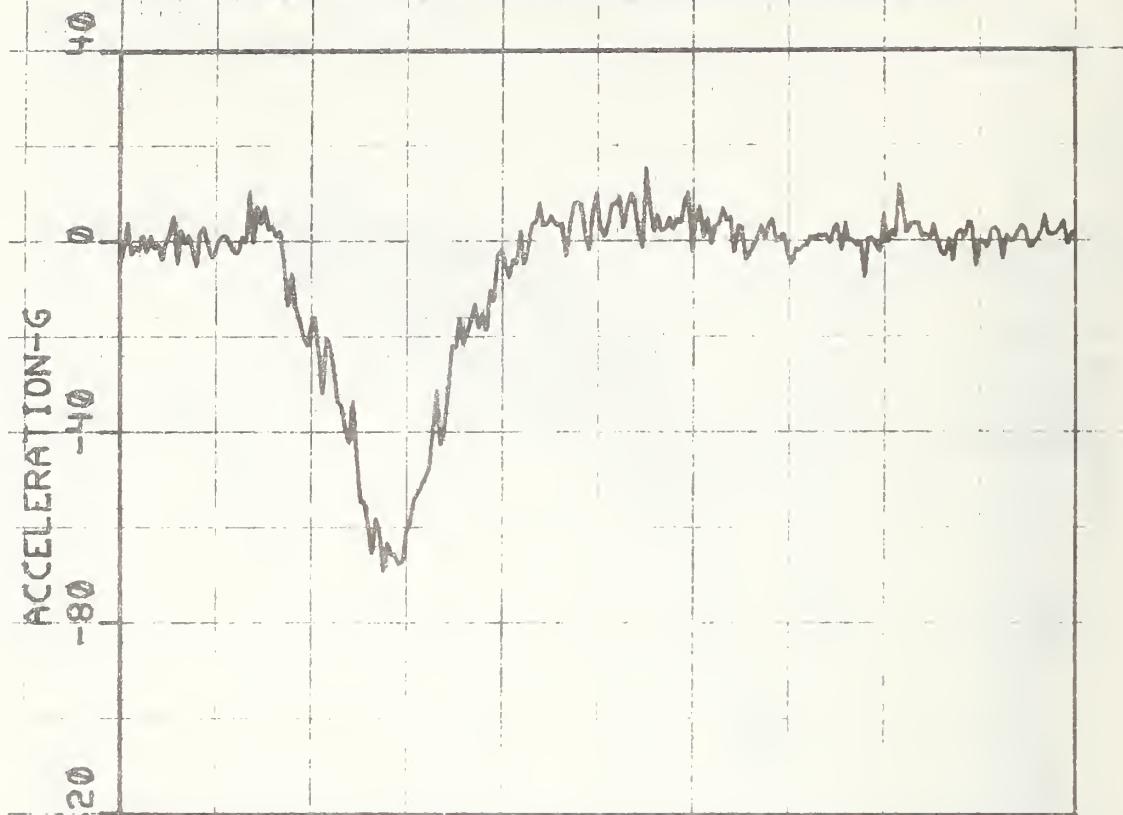
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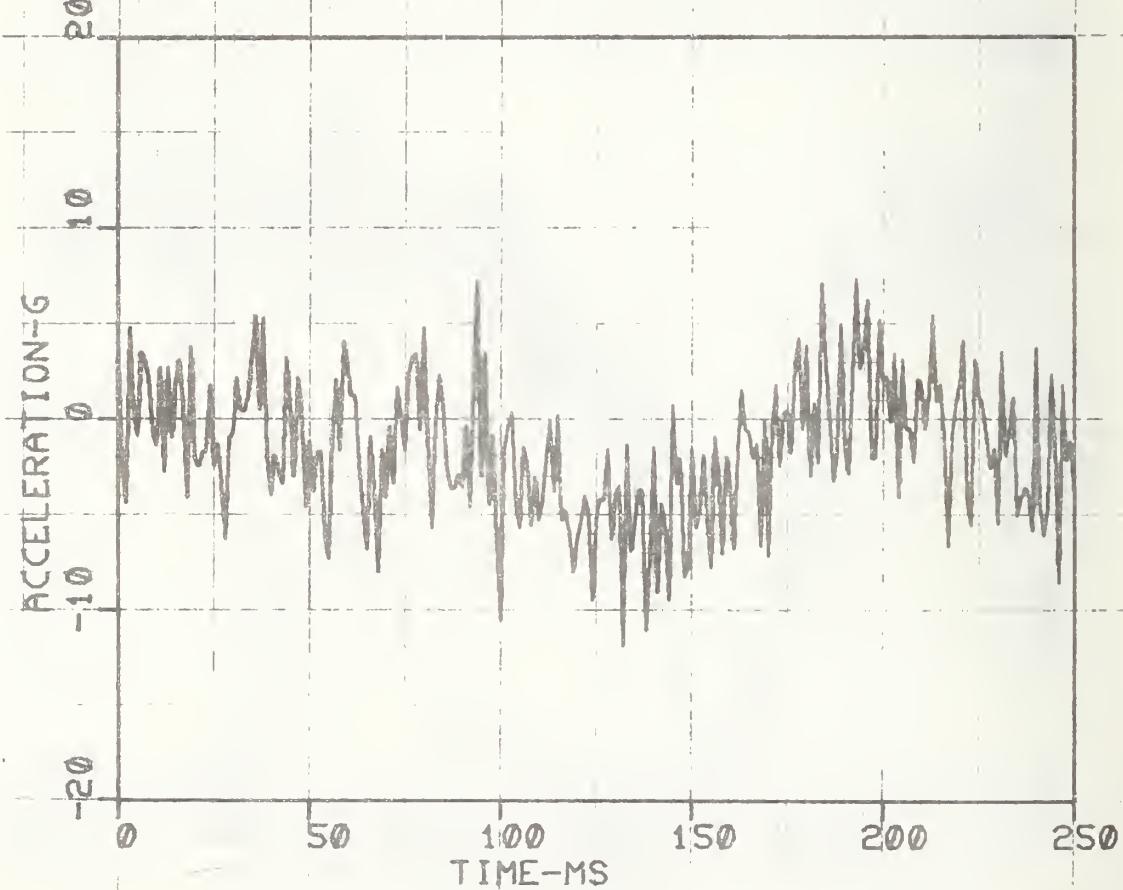
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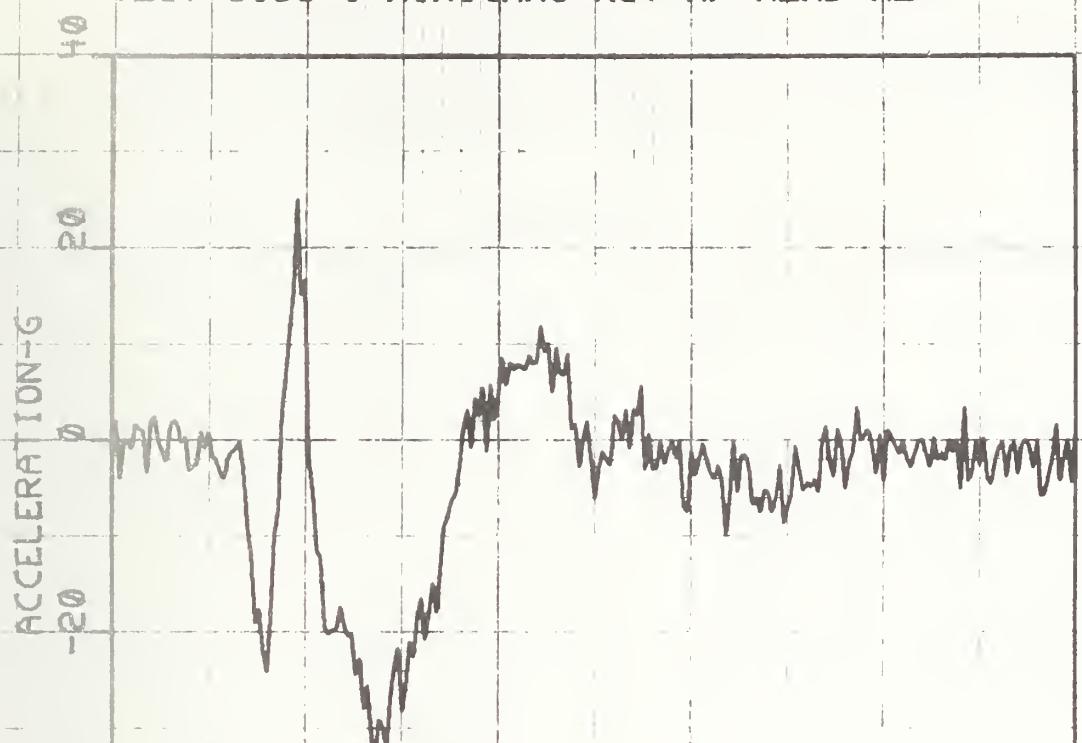
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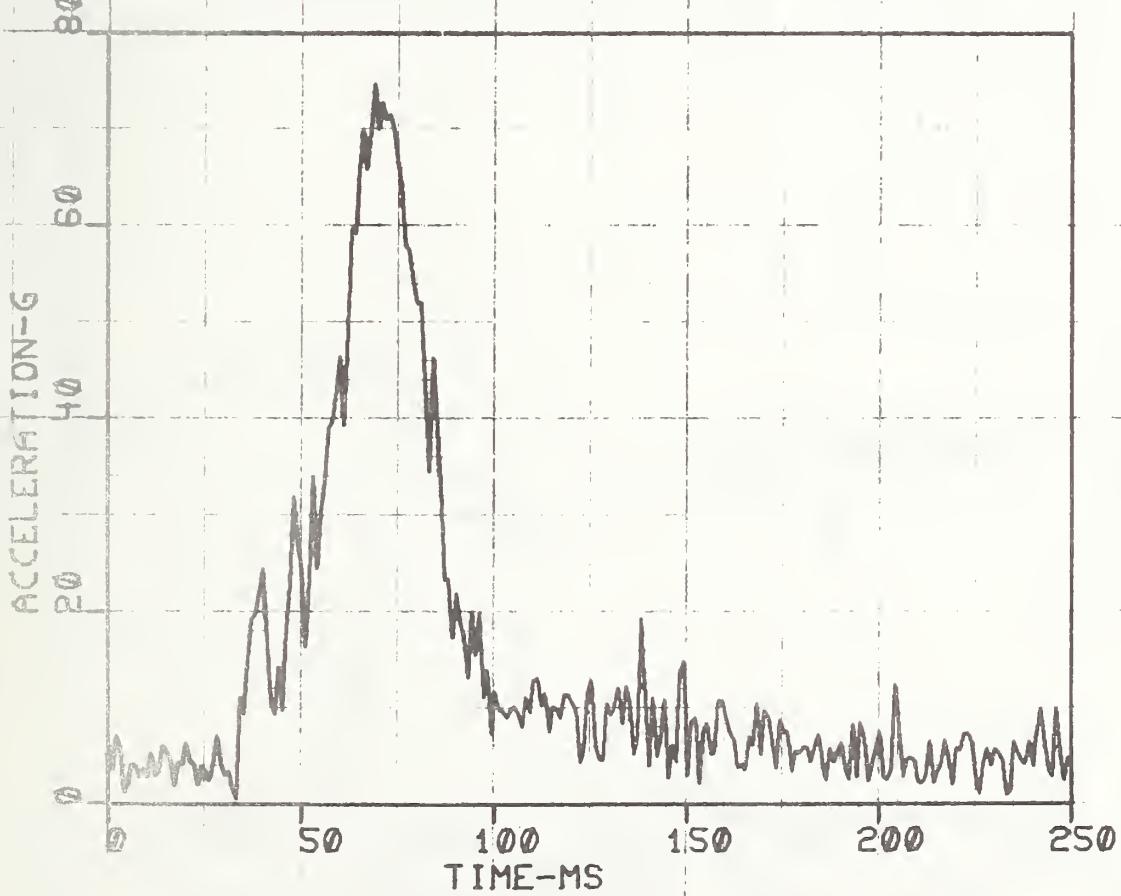
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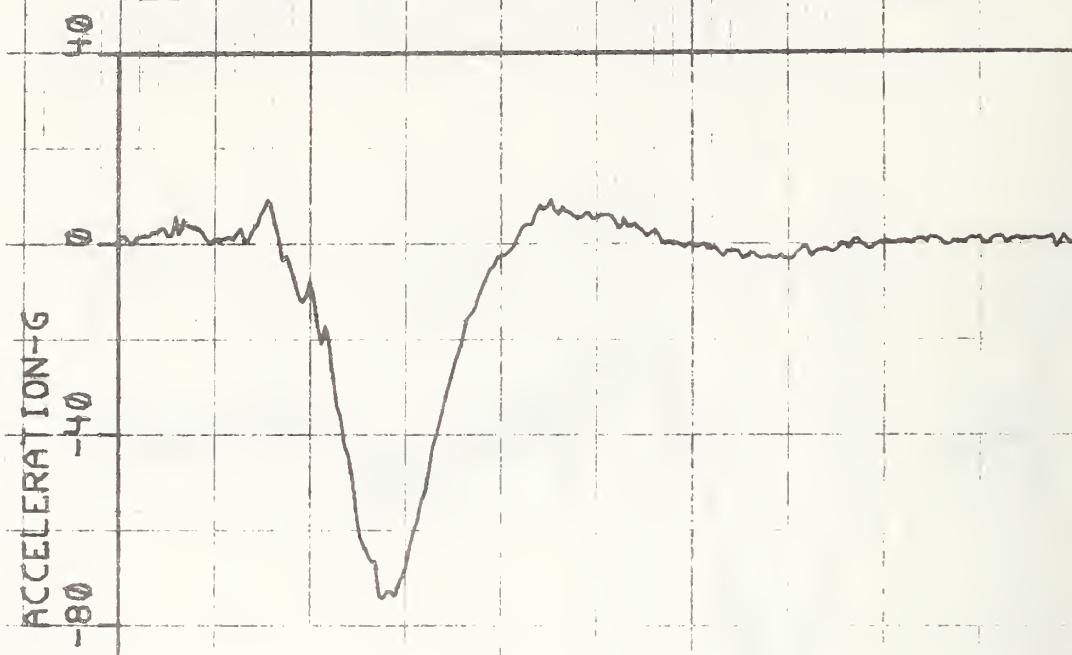
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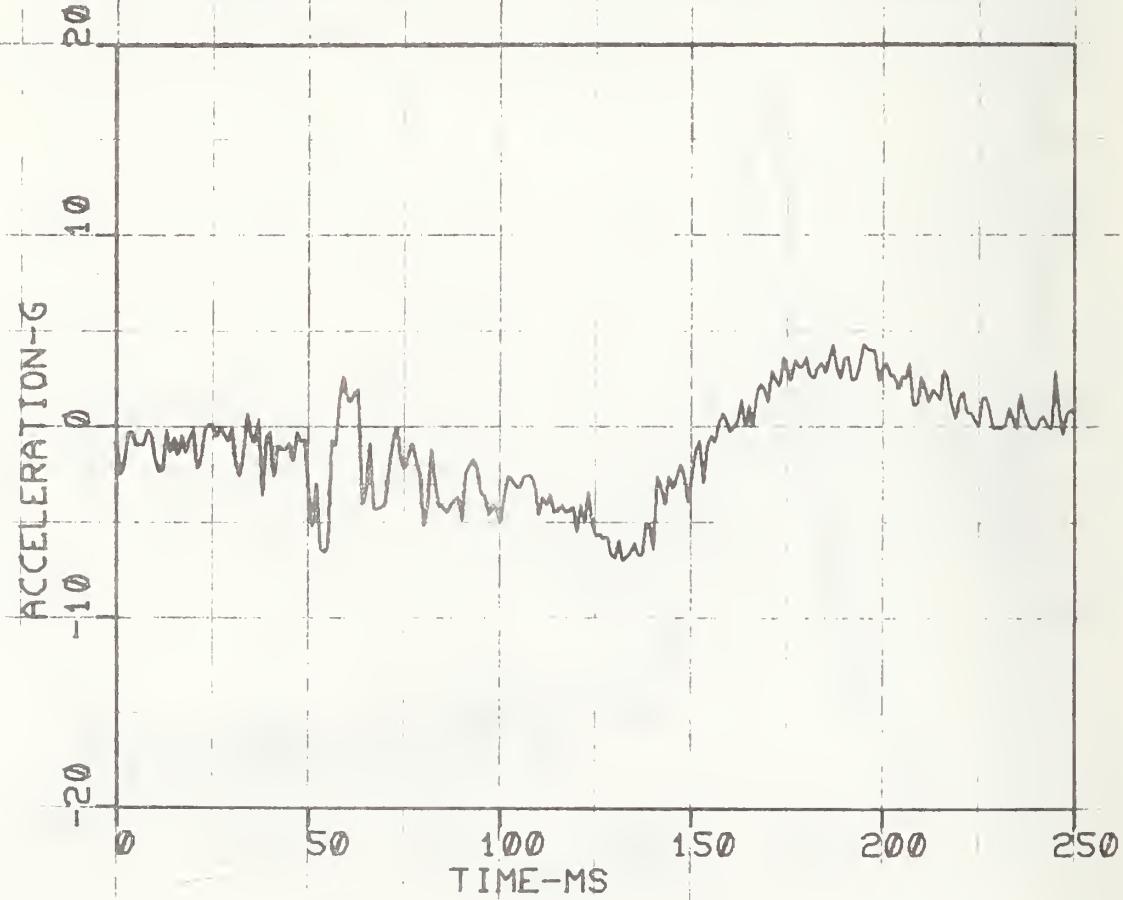
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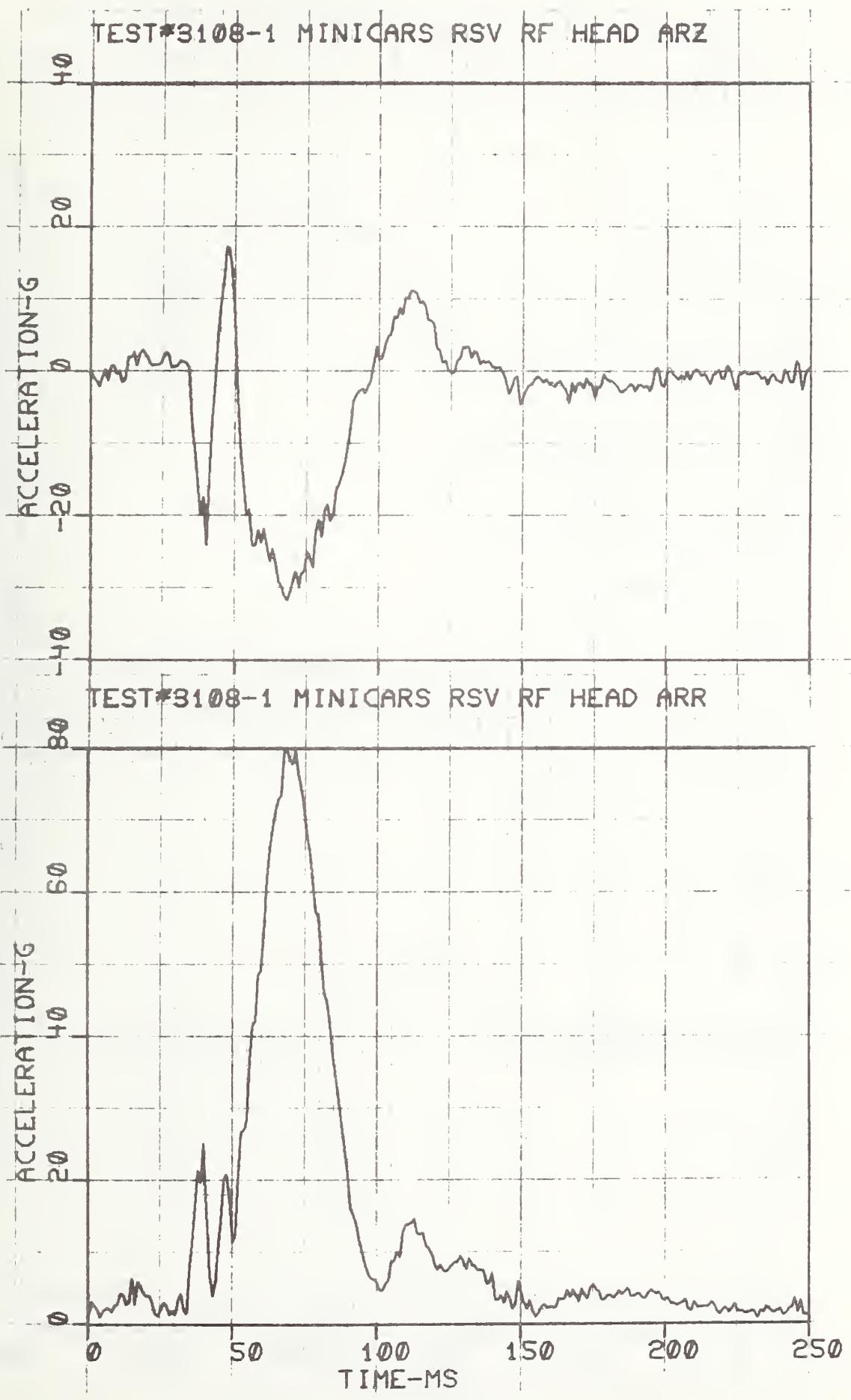


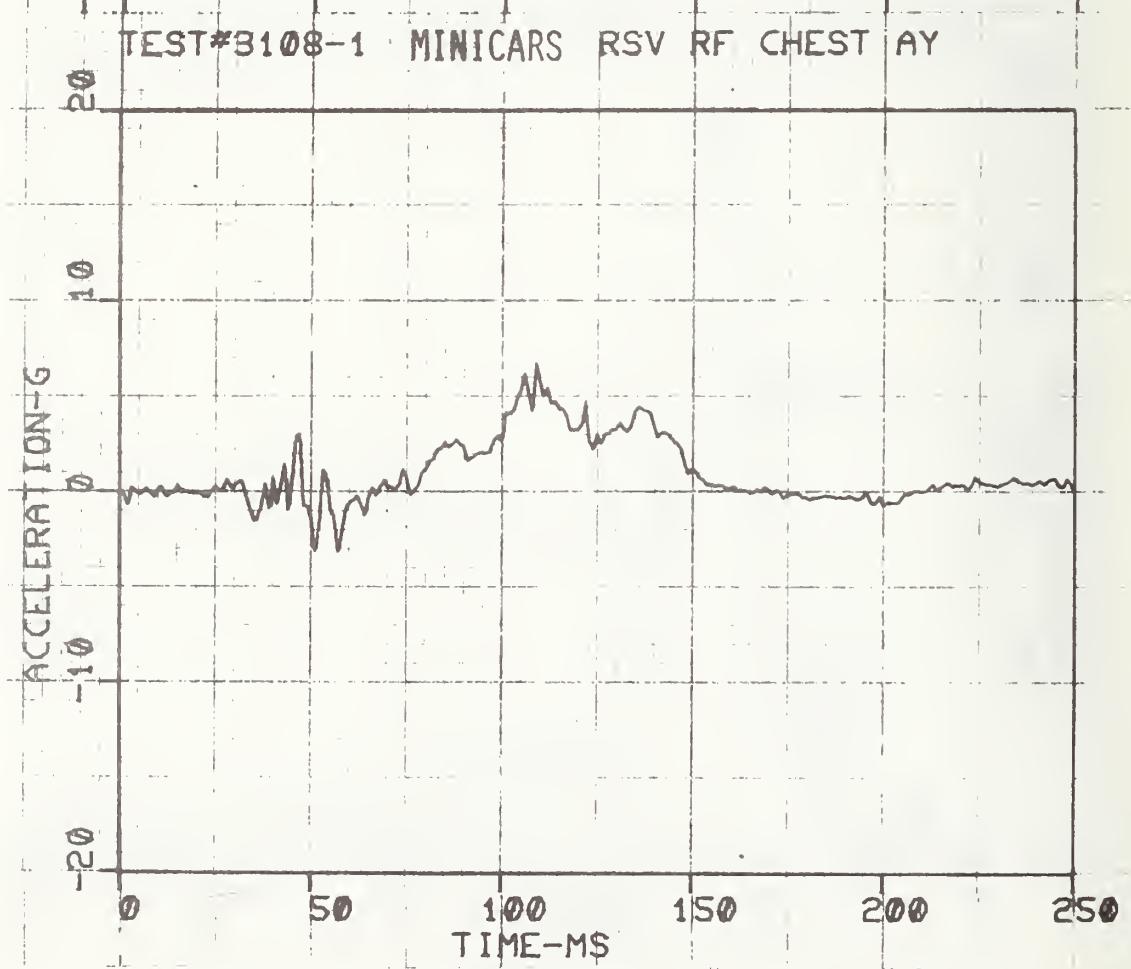
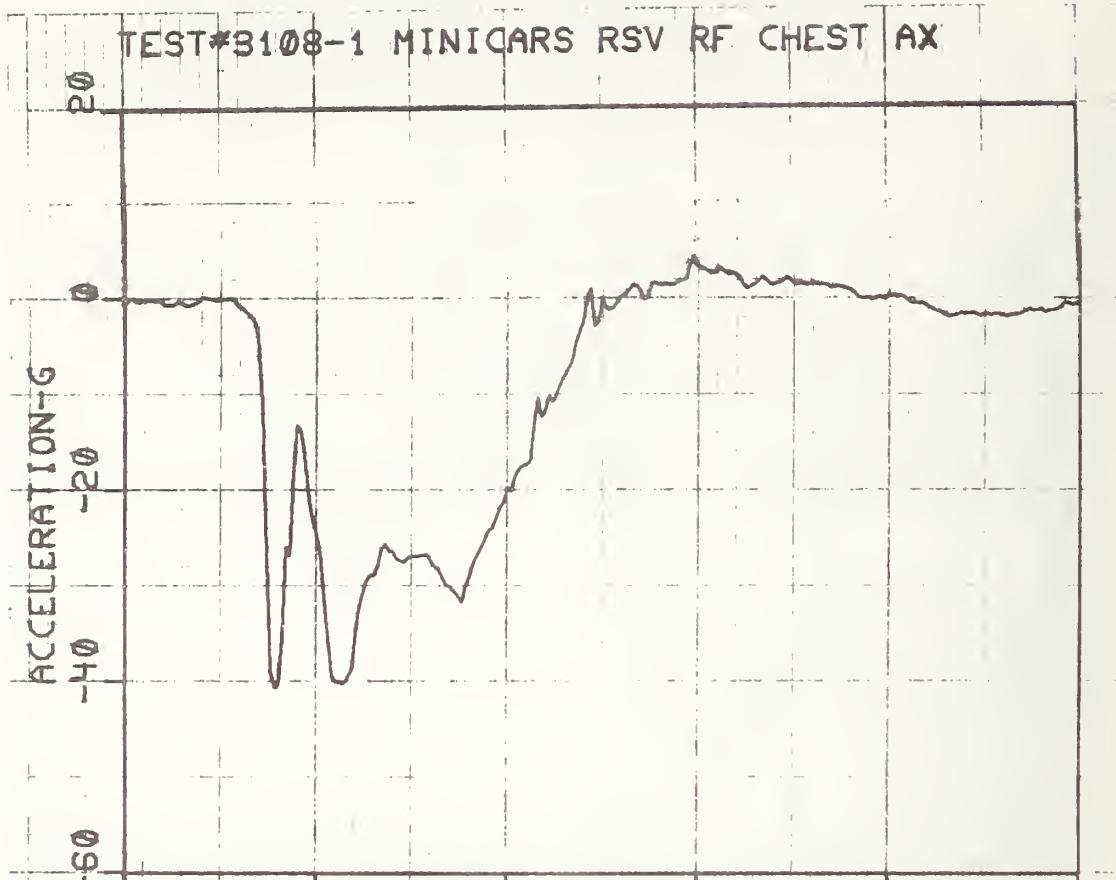
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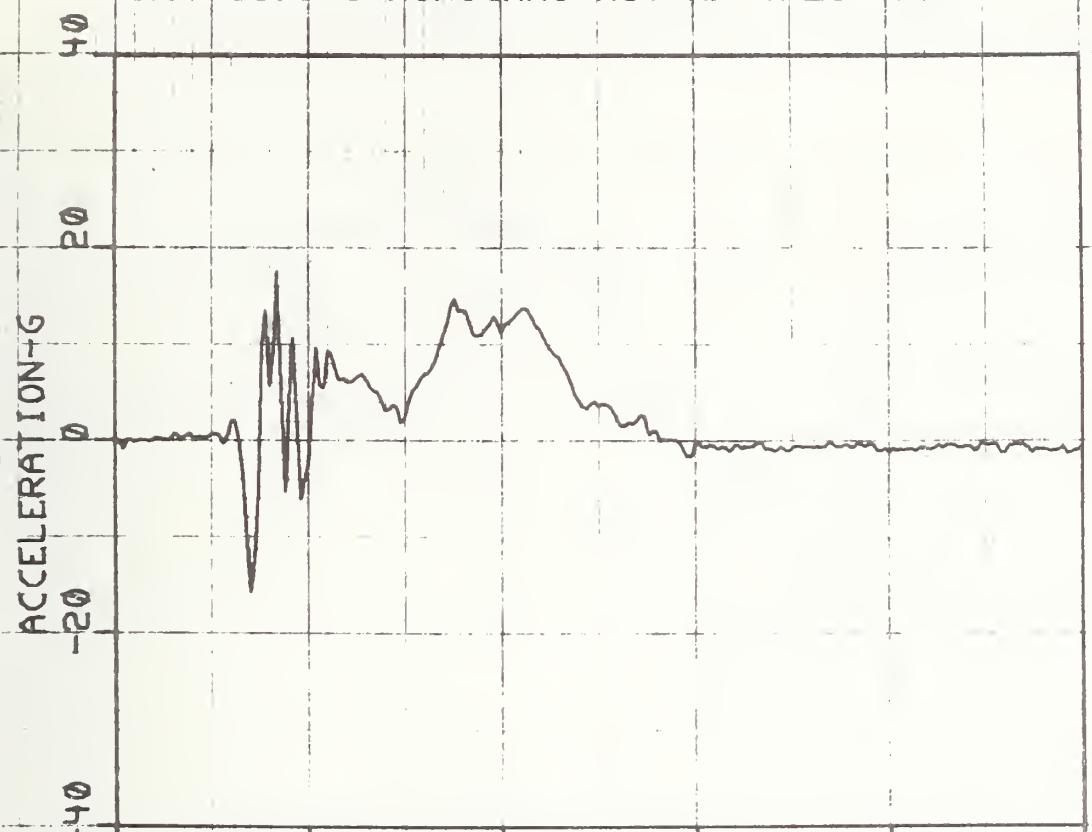
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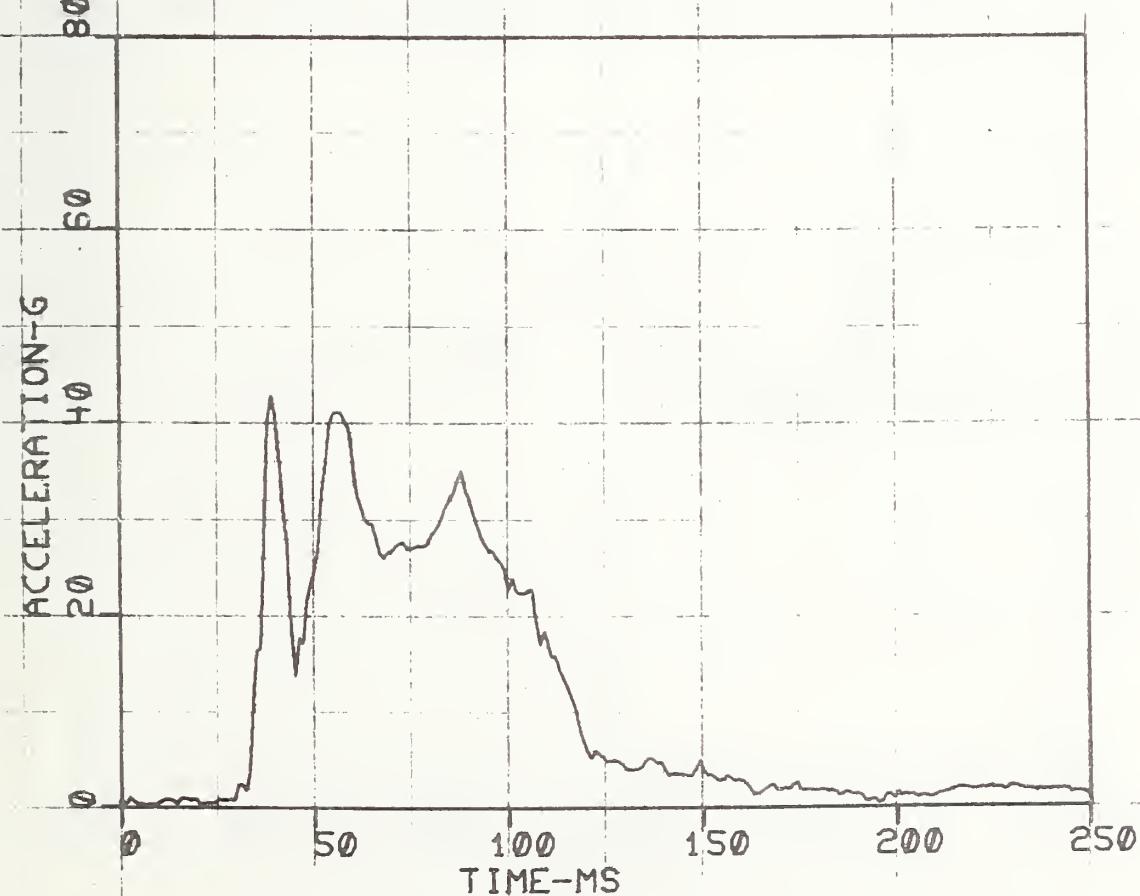




TEST#3108-1 MINICARS RSV RF CHEST AZ



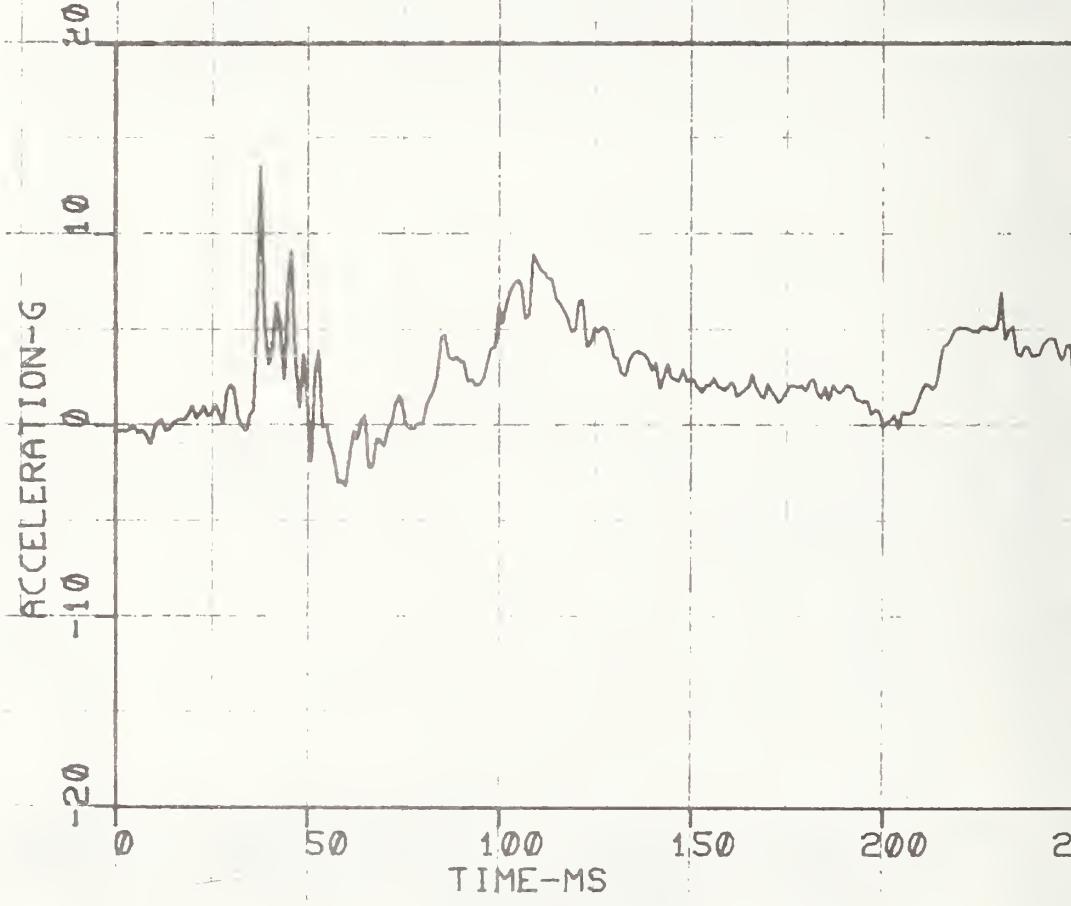
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TEST#3108-1 MINICARS RSV RF CHEST ARX



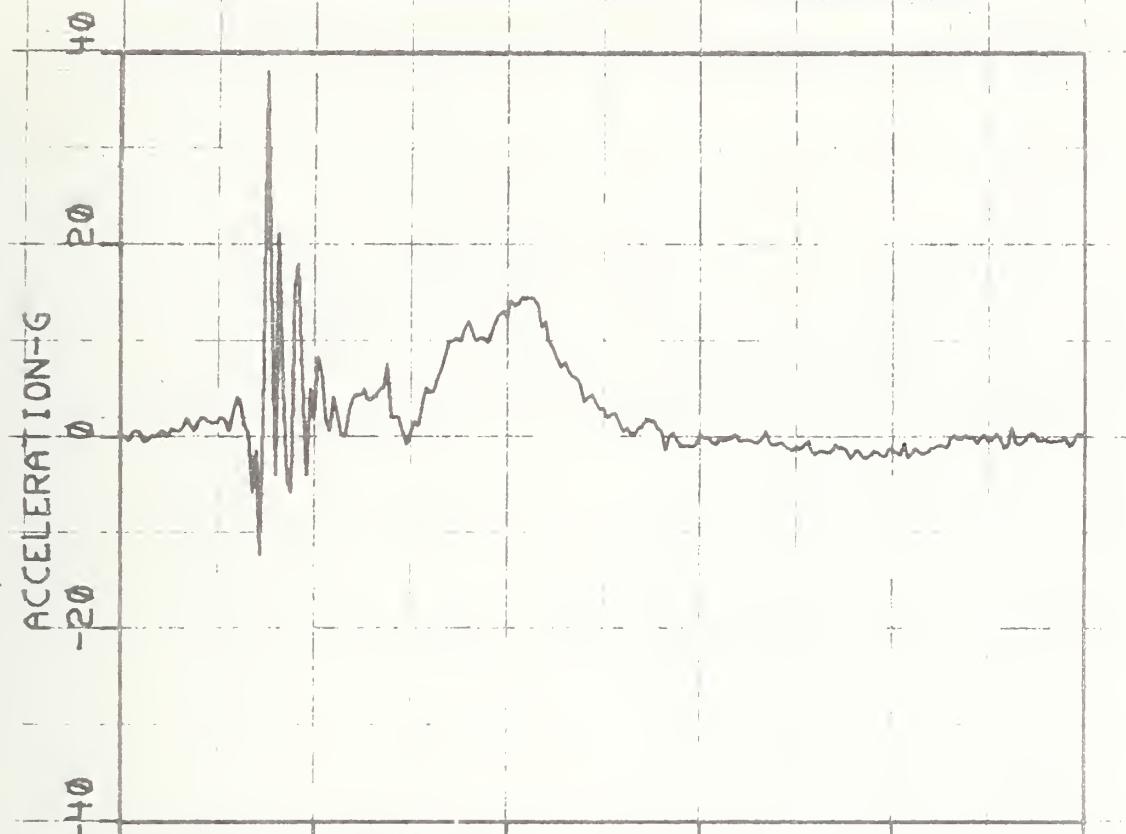
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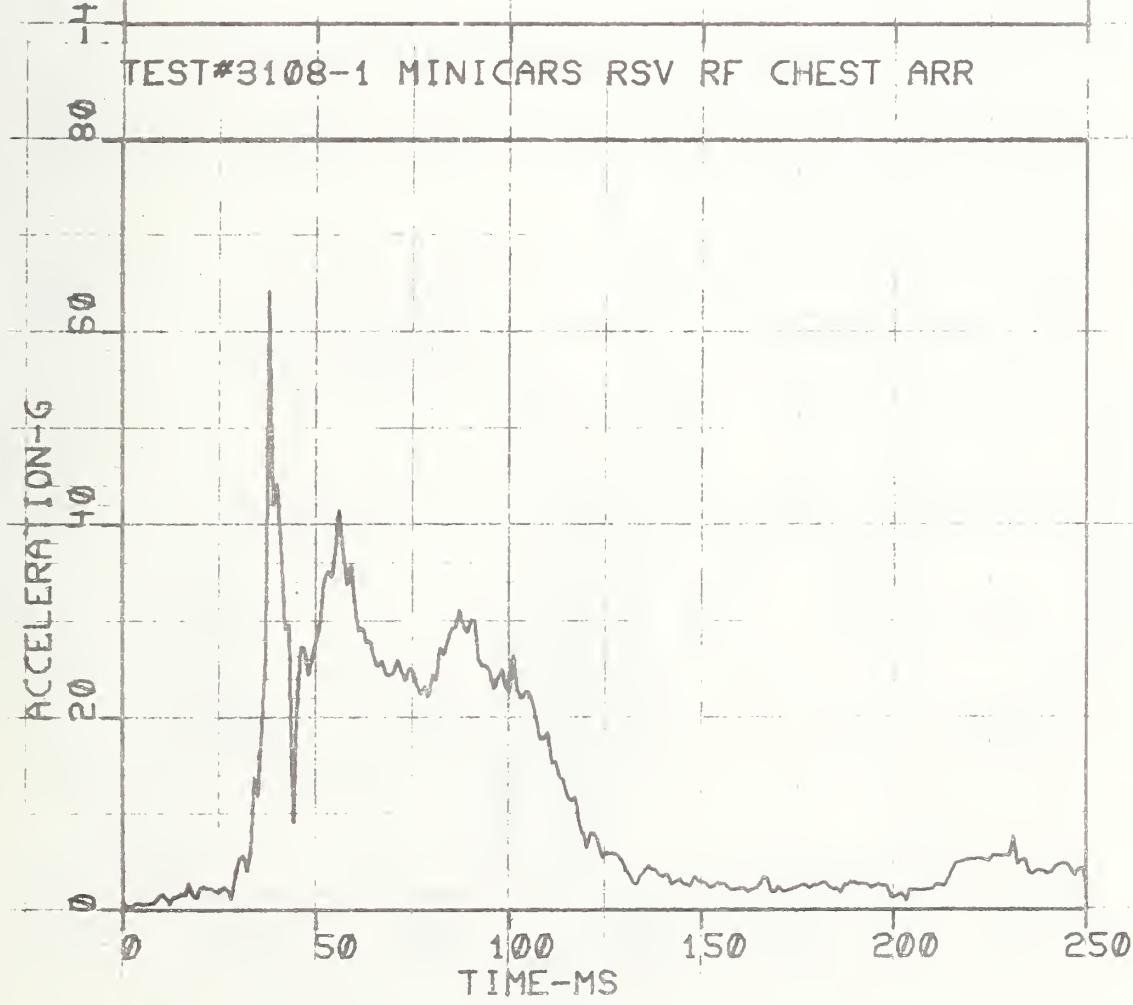
TIME-MS

A-20

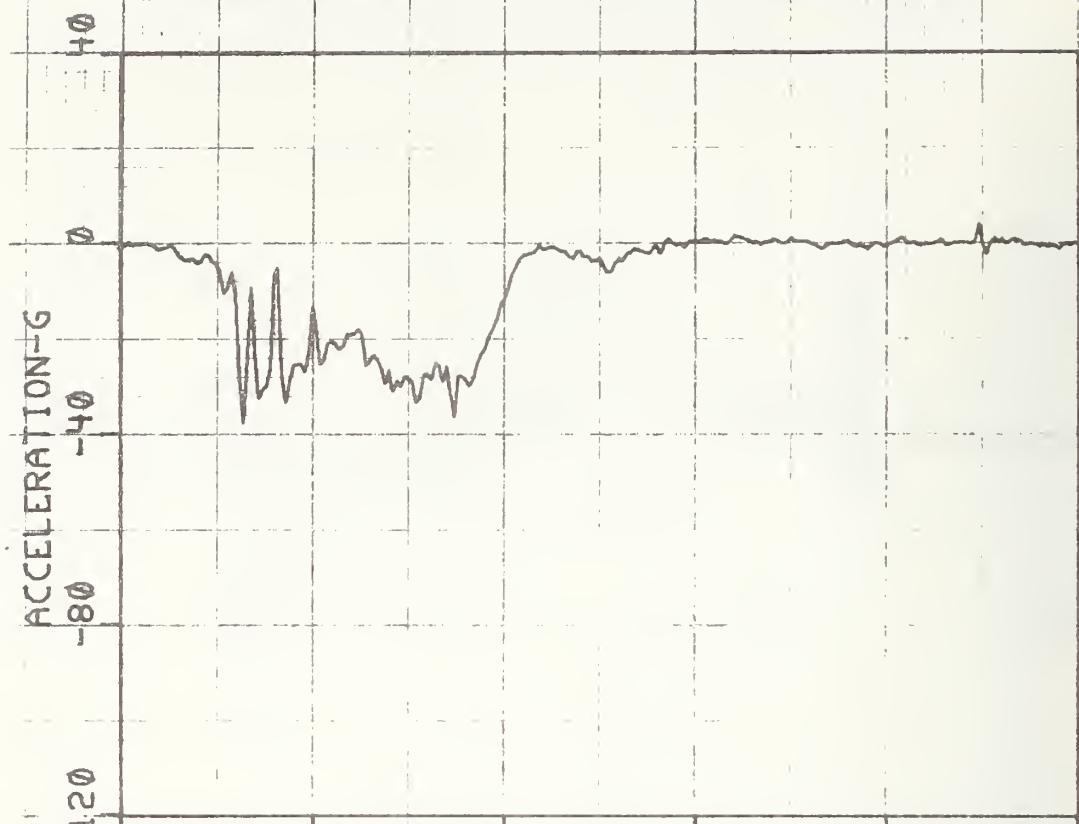
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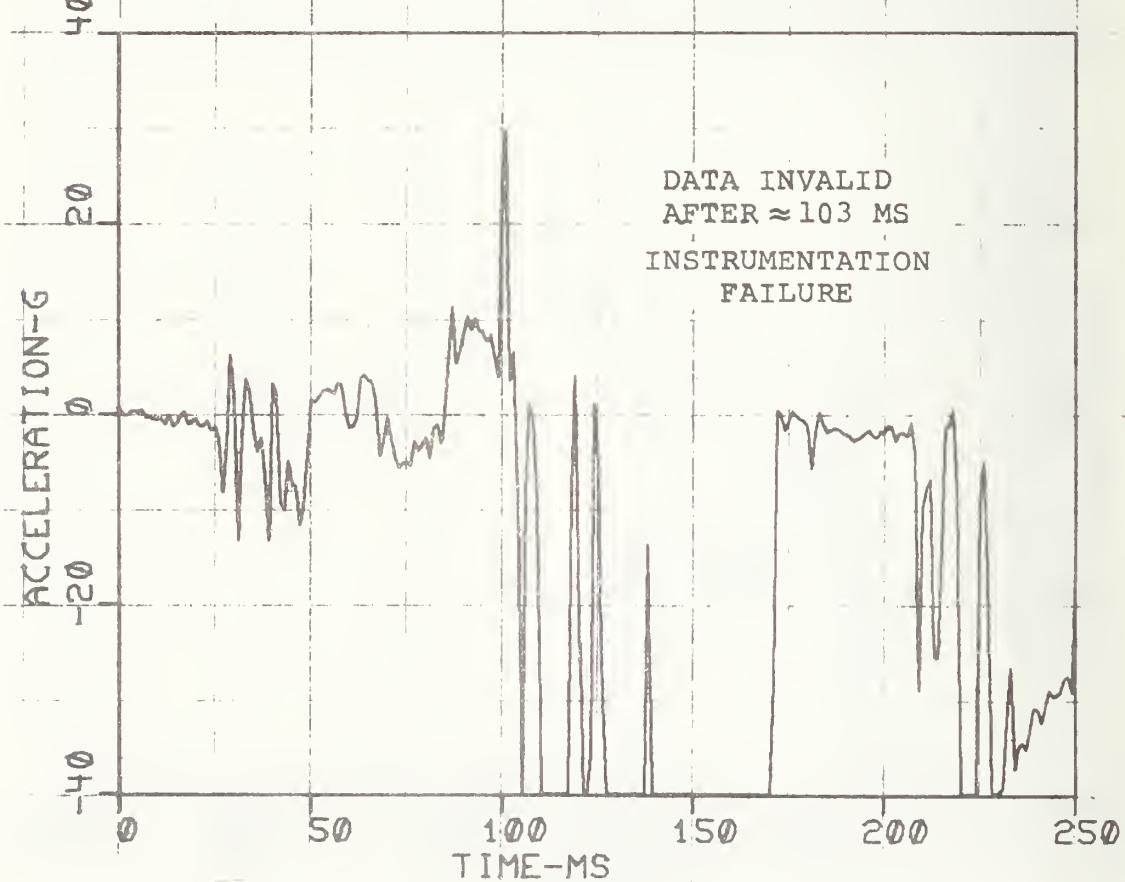
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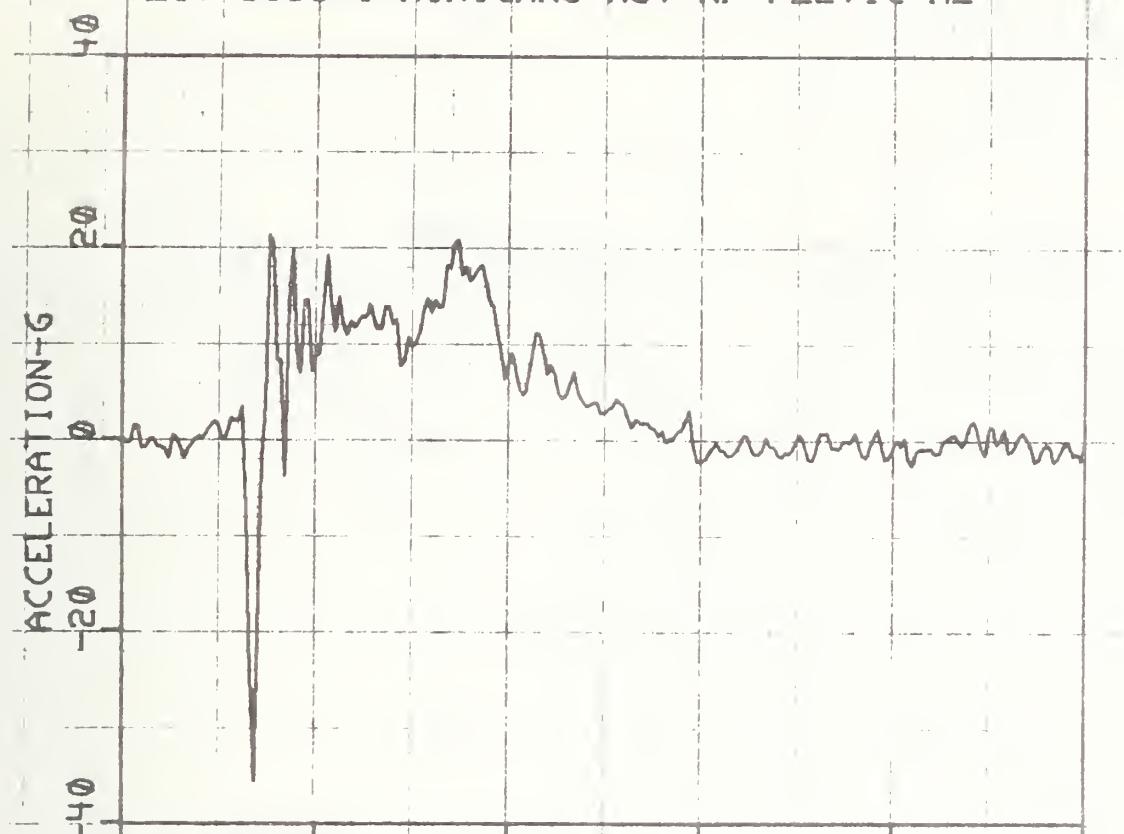
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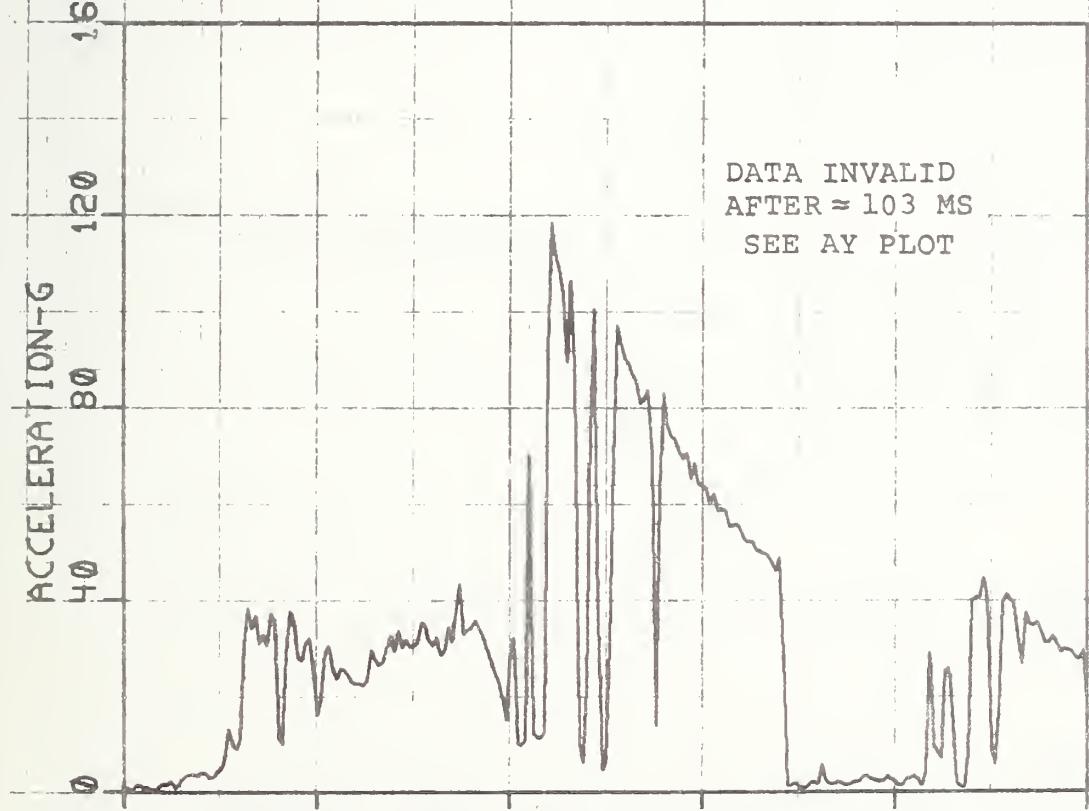
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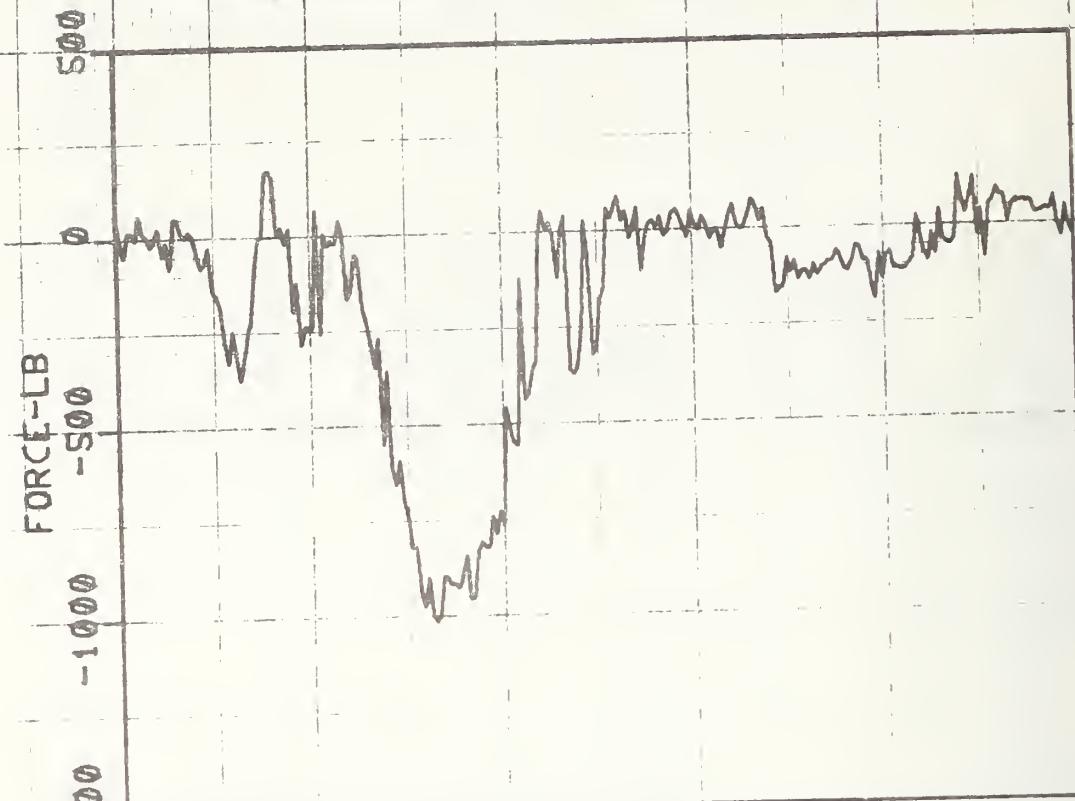
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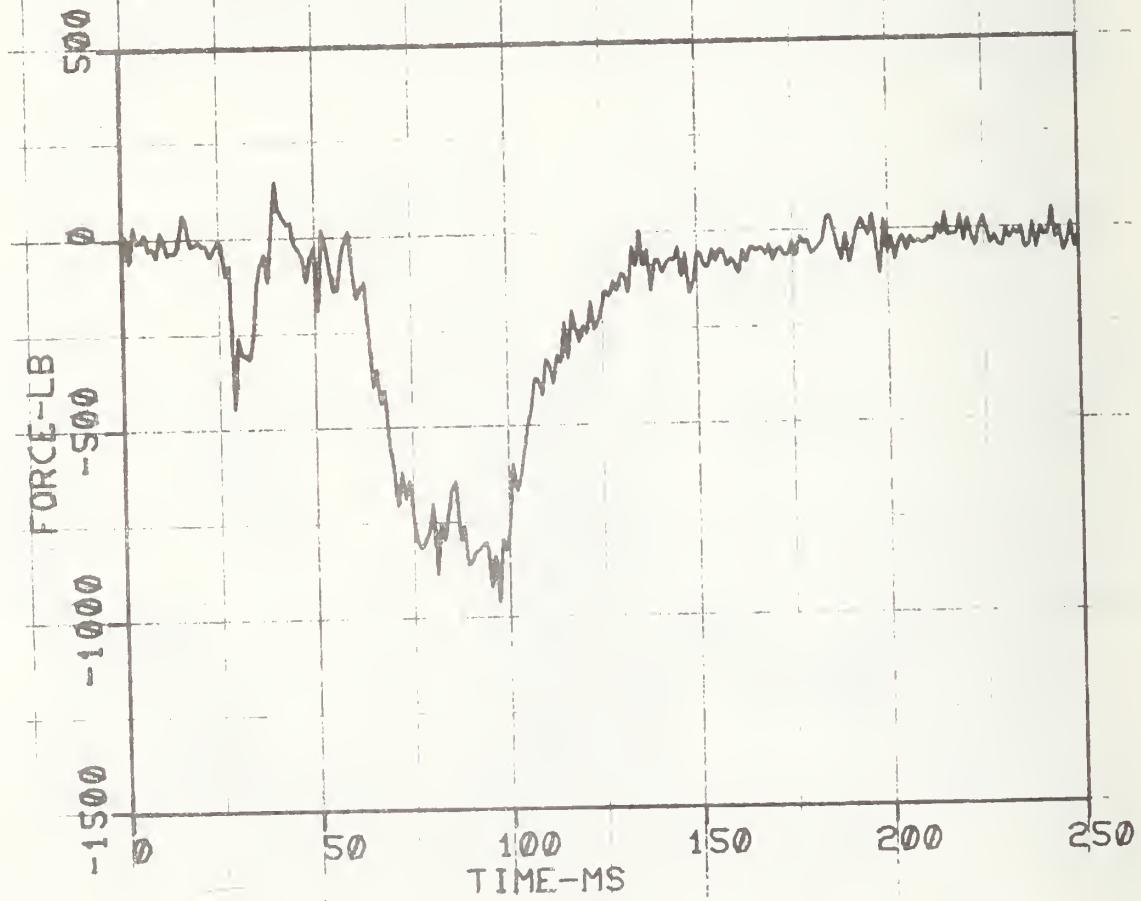
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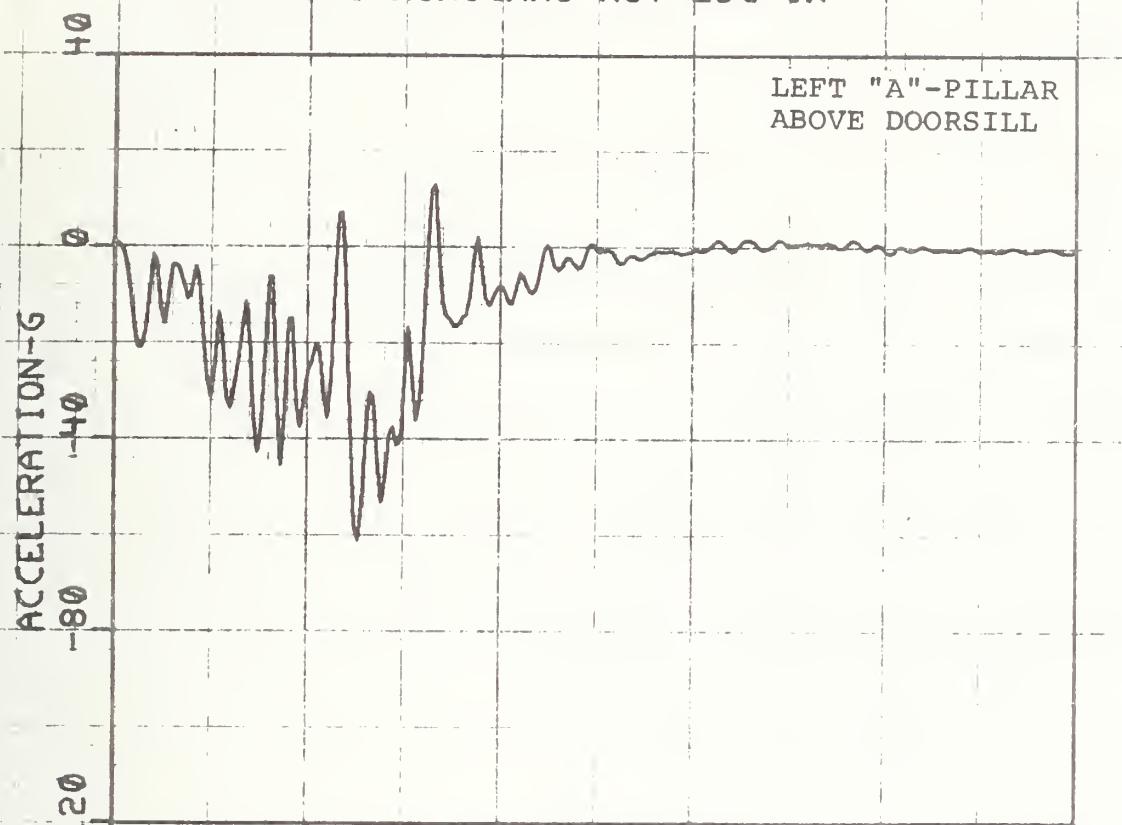
TEST#3108-1 MINICARS RSV RF FEMUR LEFT



TEST#3108-1 MINICARS RSV RF FEMUR RIGHT

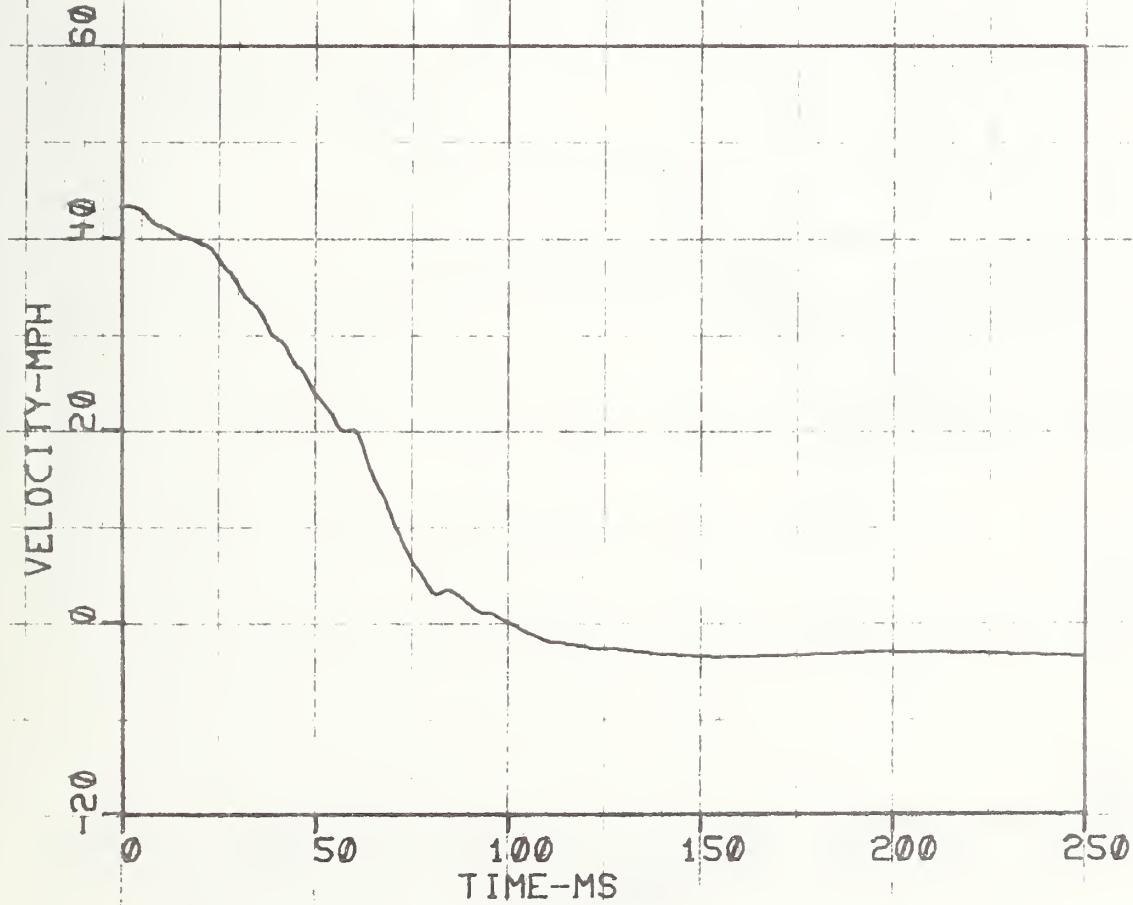


TEST#3108-1 MINICARS RSV LOC 1X

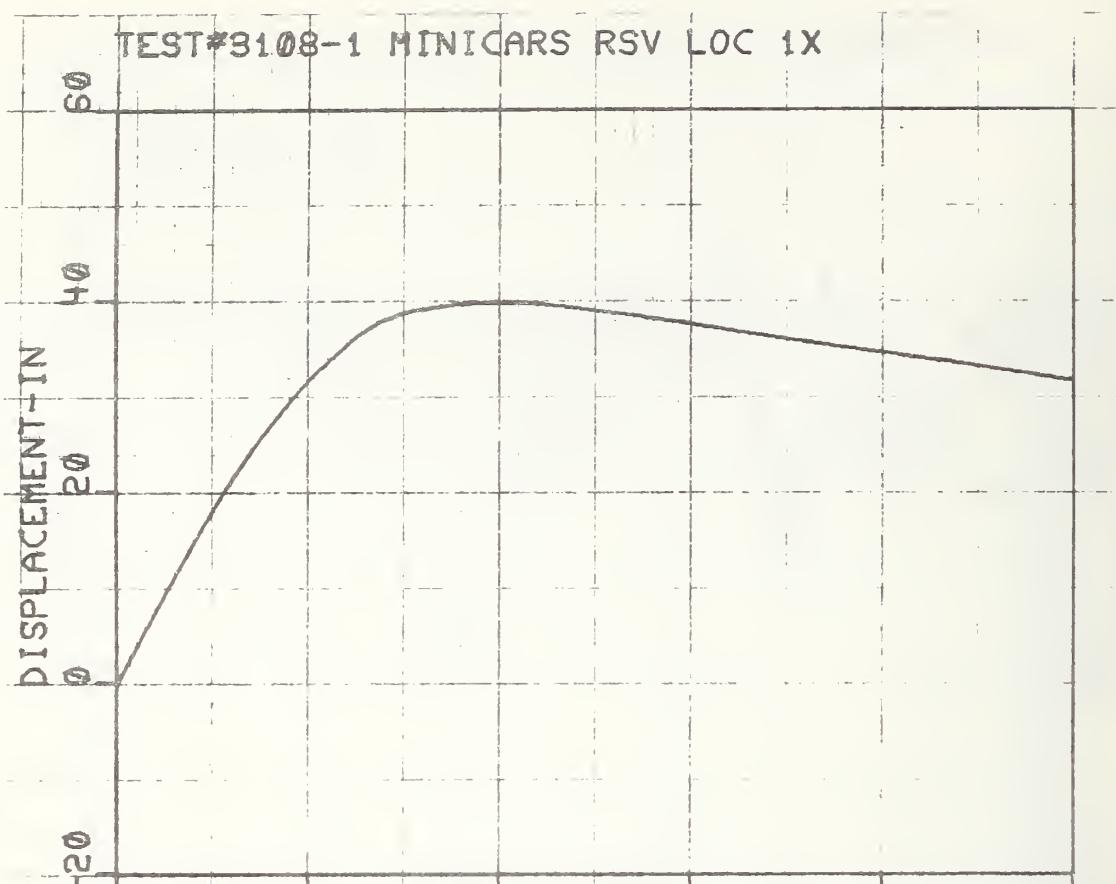


LEFT "A"-PILLAR
ABOVE DOORSILL

TEST#3108-1 MINICARS RSV LOC 1X

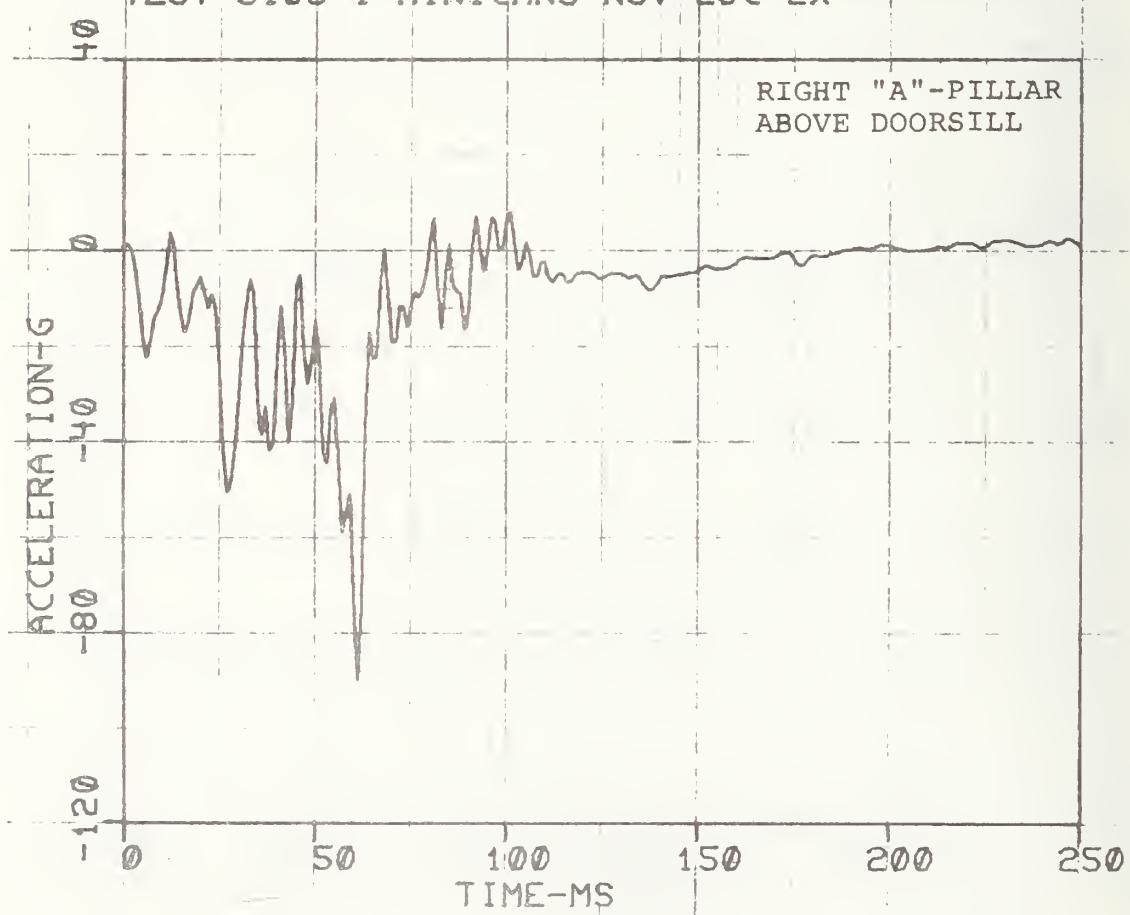


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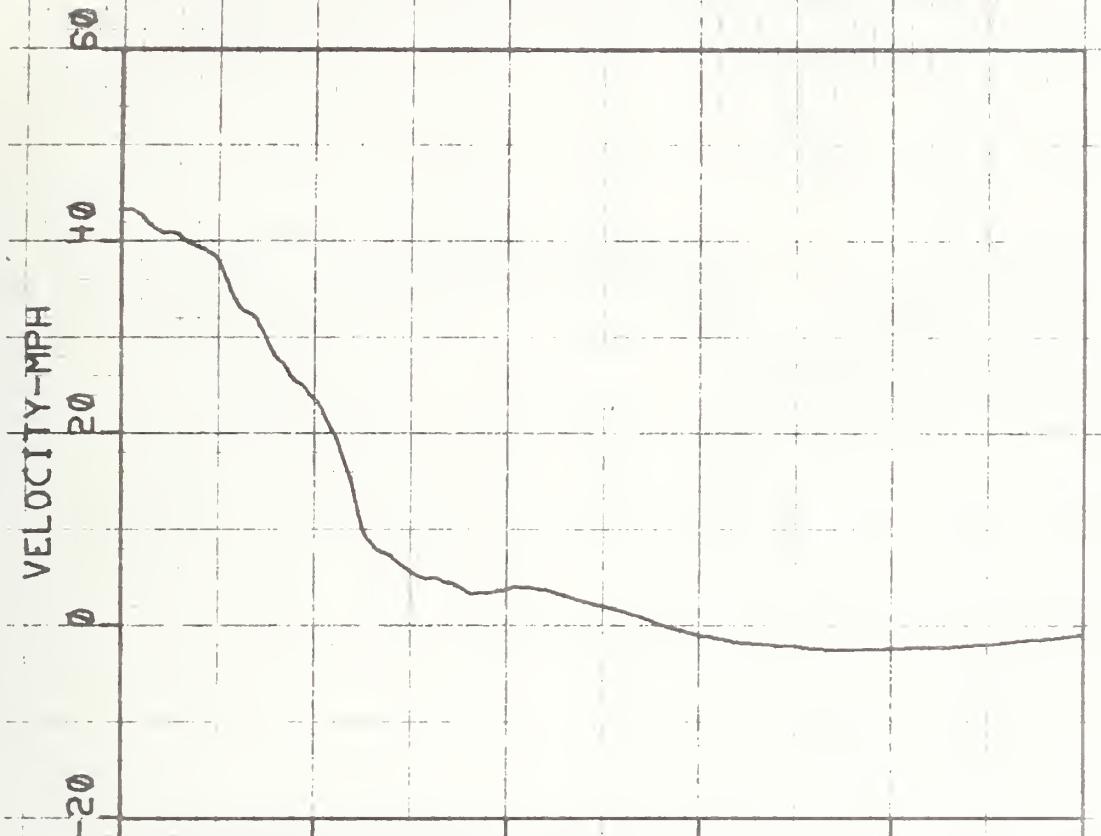


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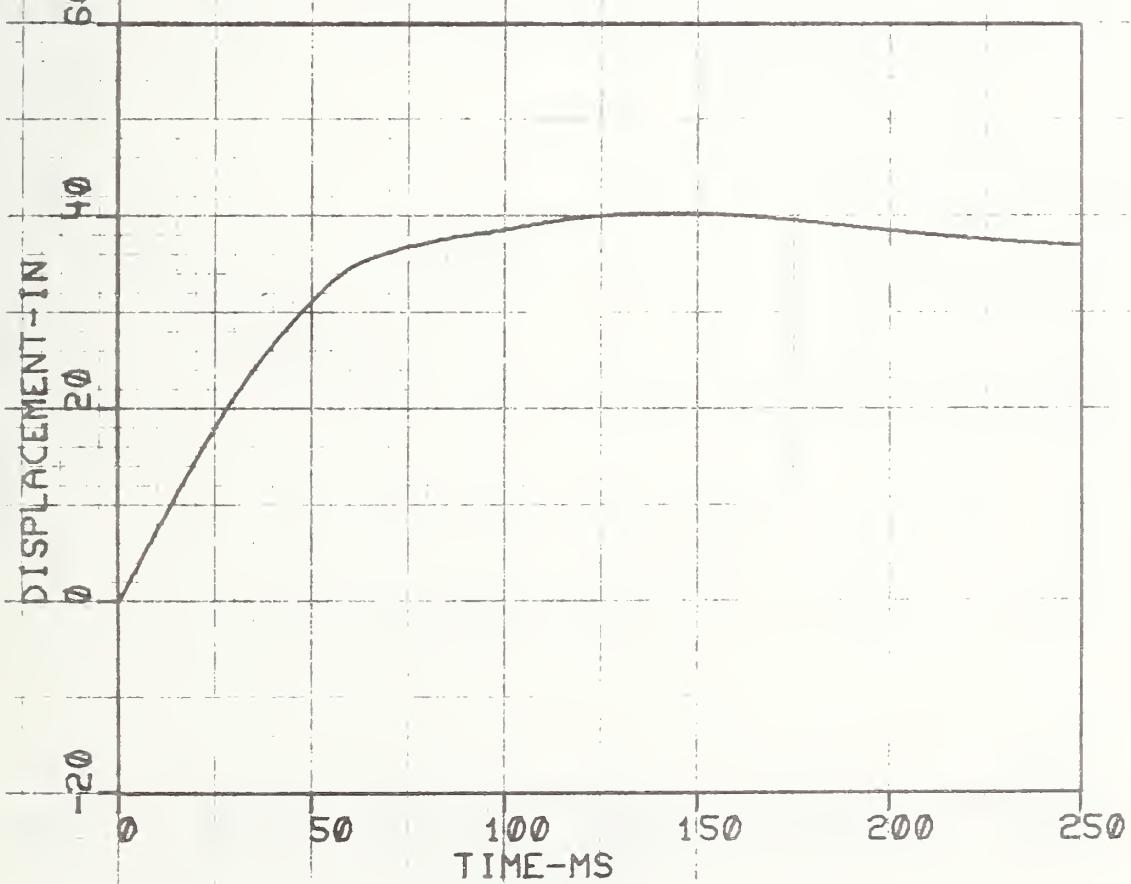
RIGHT "A"-PILLAR
ABOVE DOORSILL



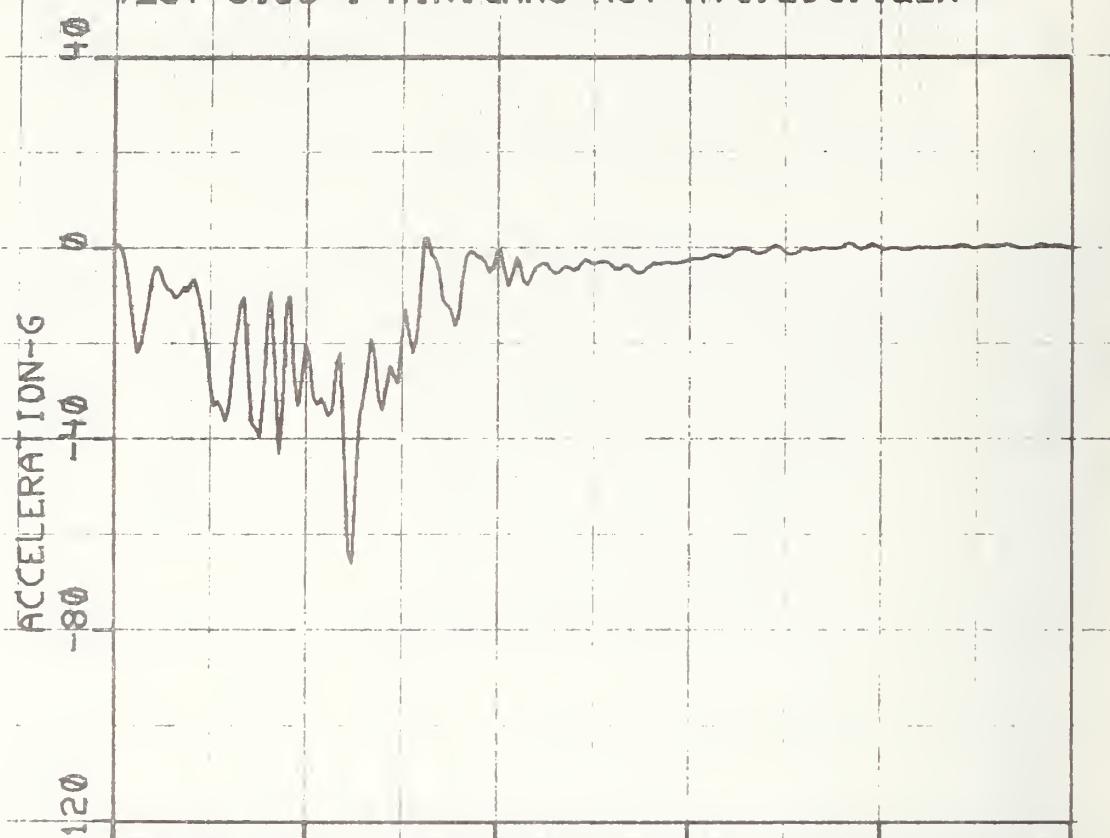
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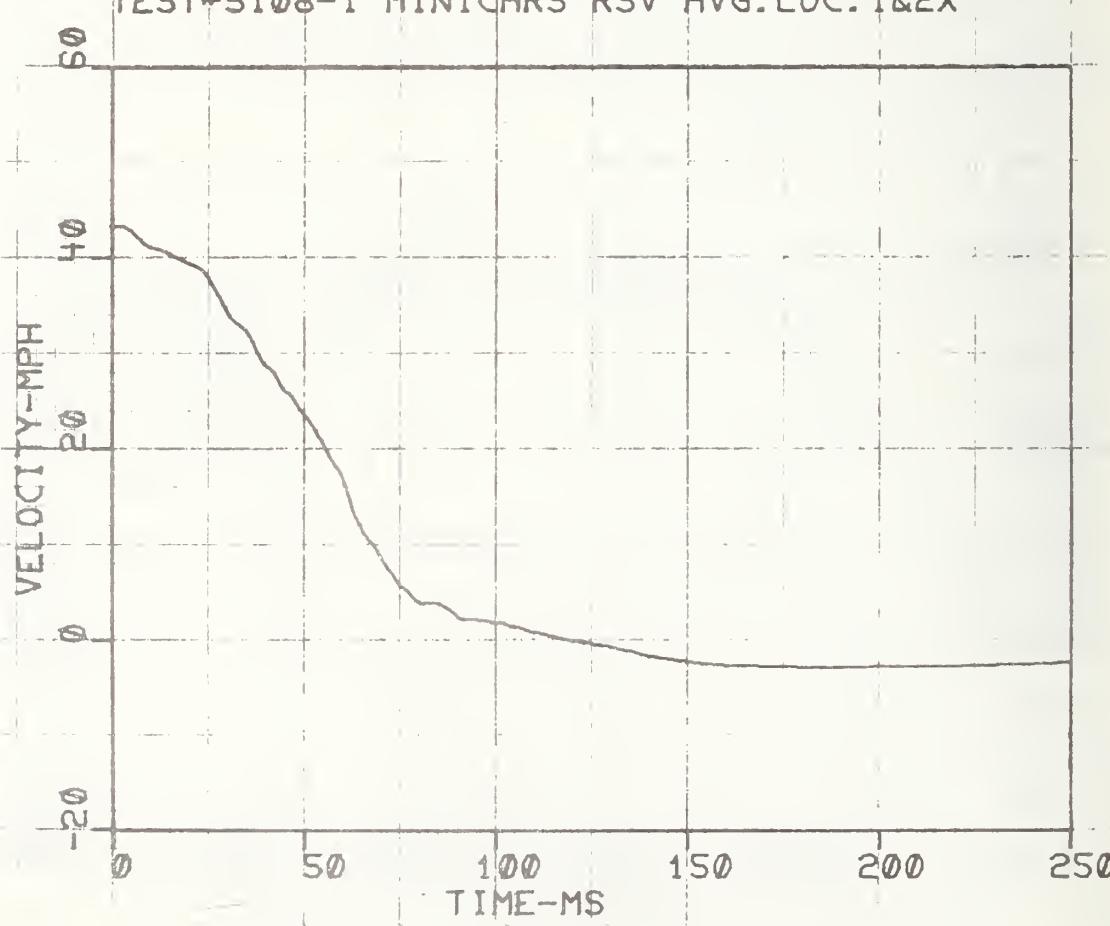
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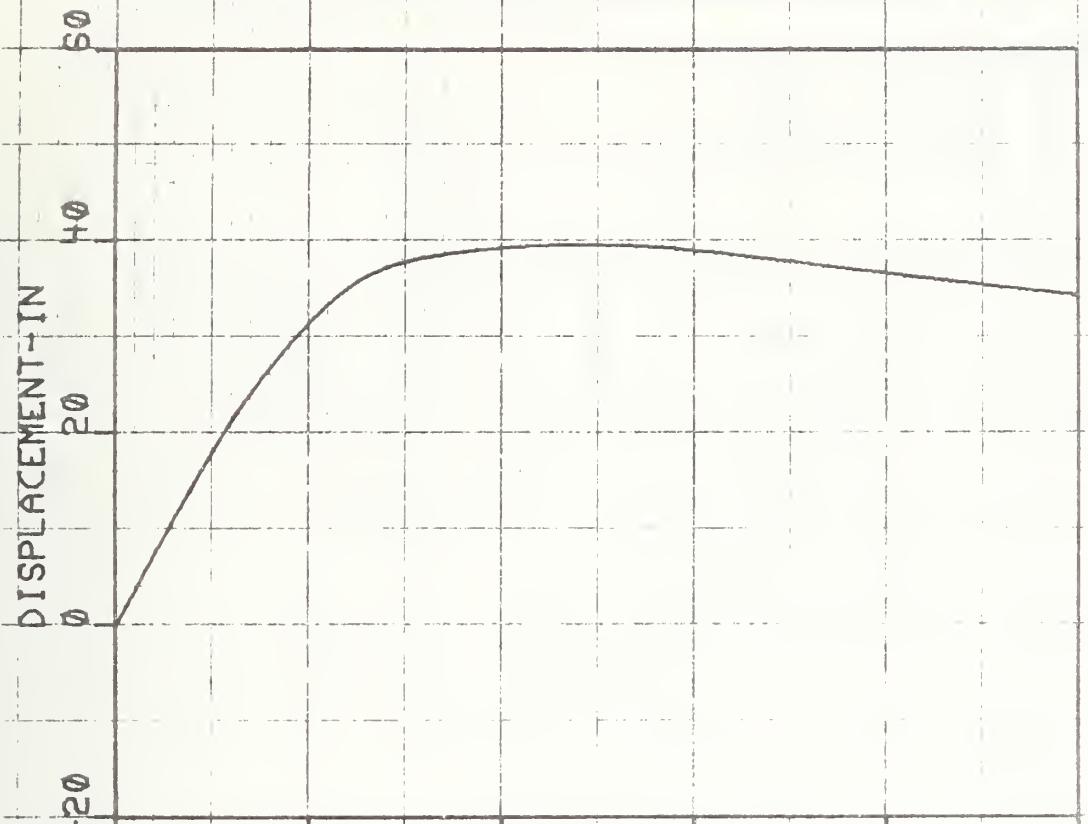
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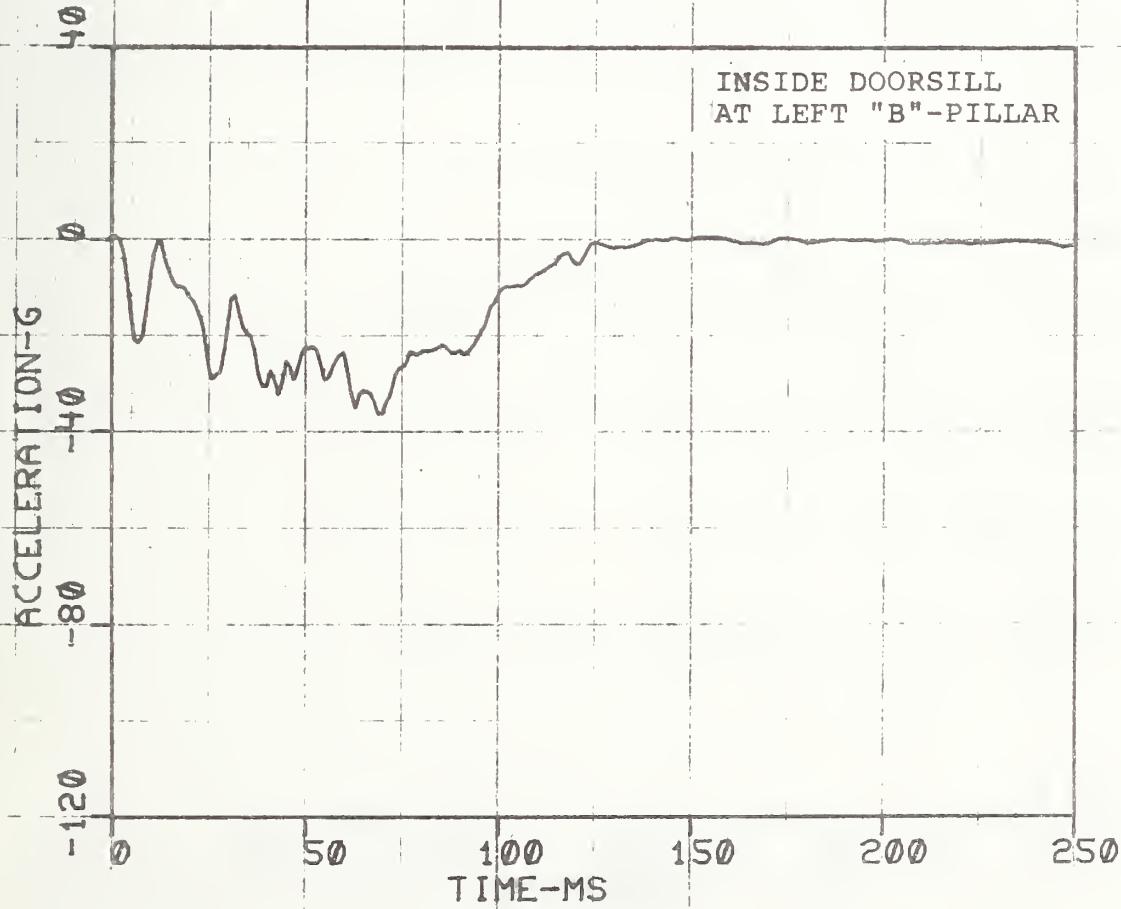
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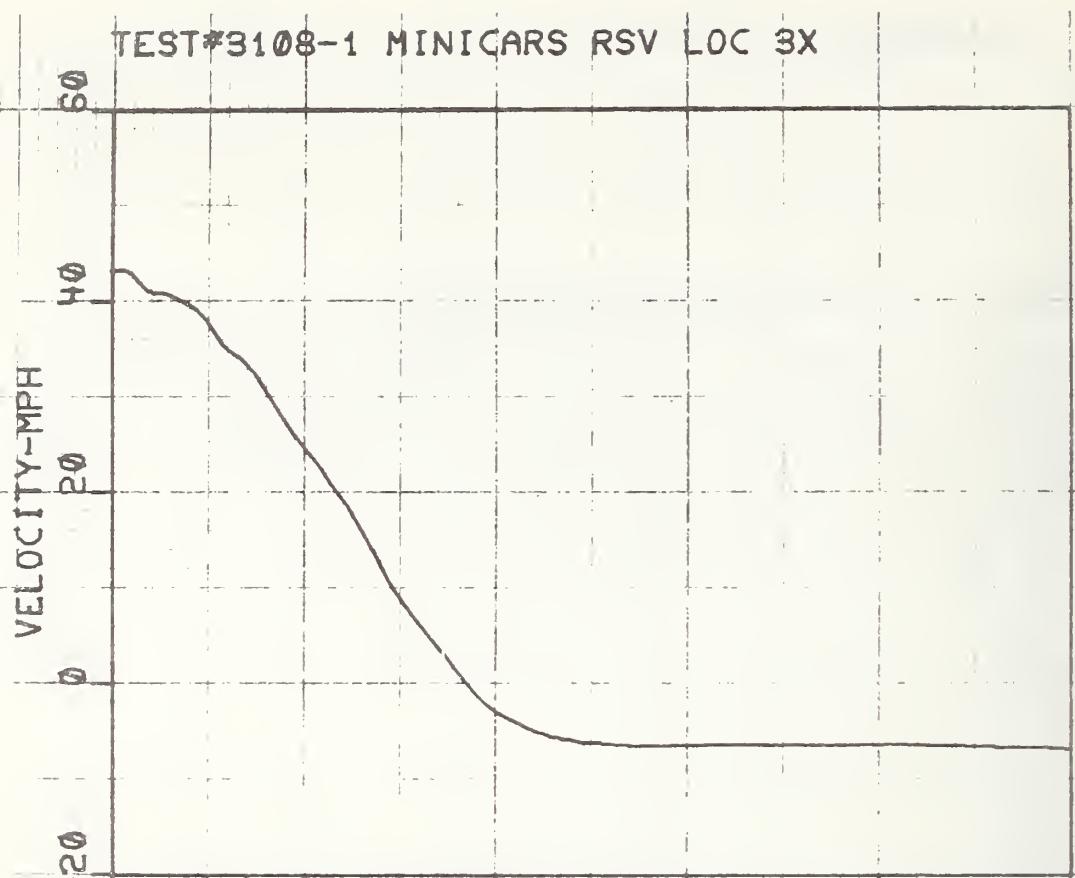
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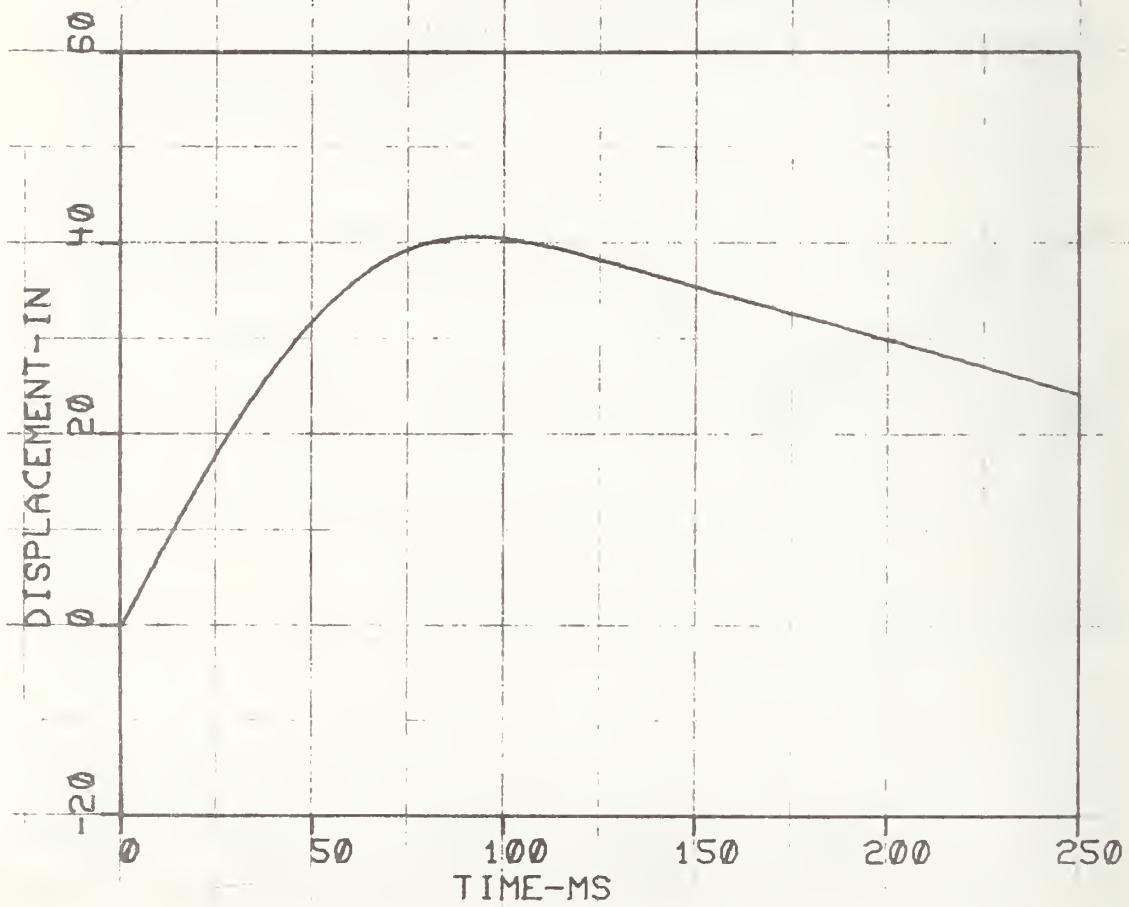
TEST#3108-1 MINICARS RSV LOC 3X



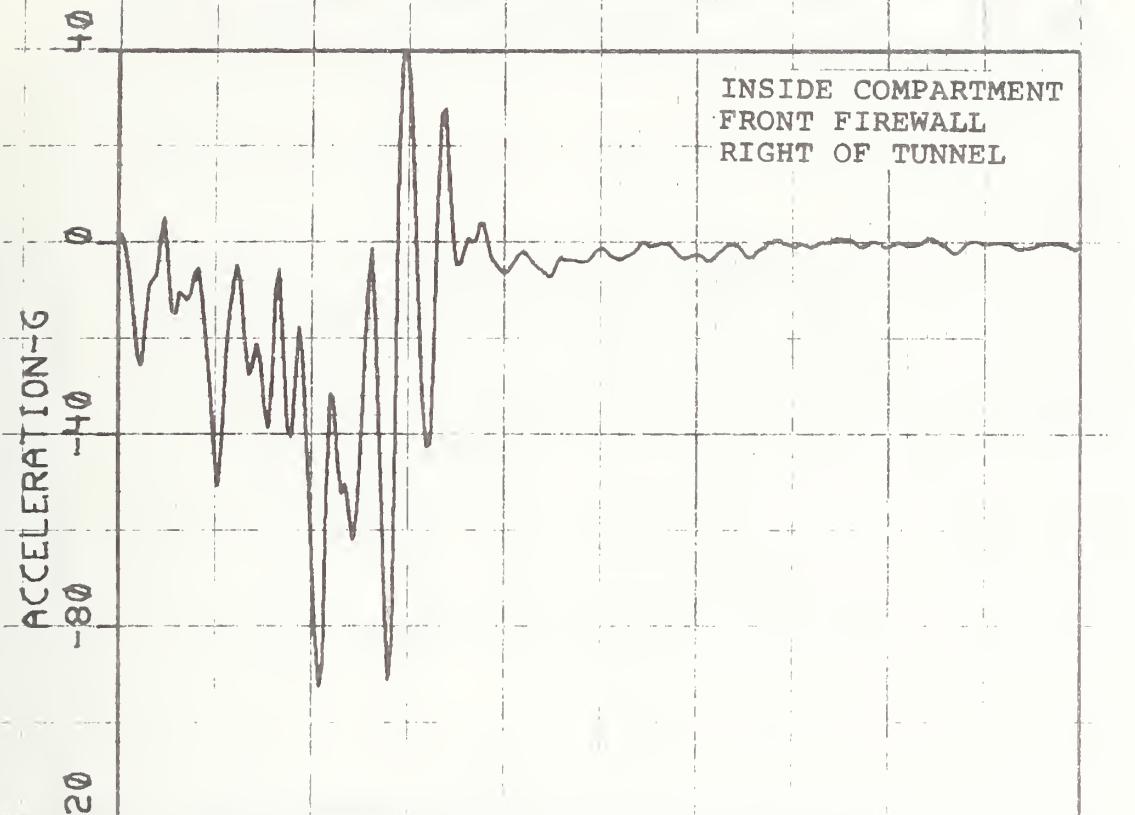
TEST#3108-1 MINICARS RSV LOC 3X



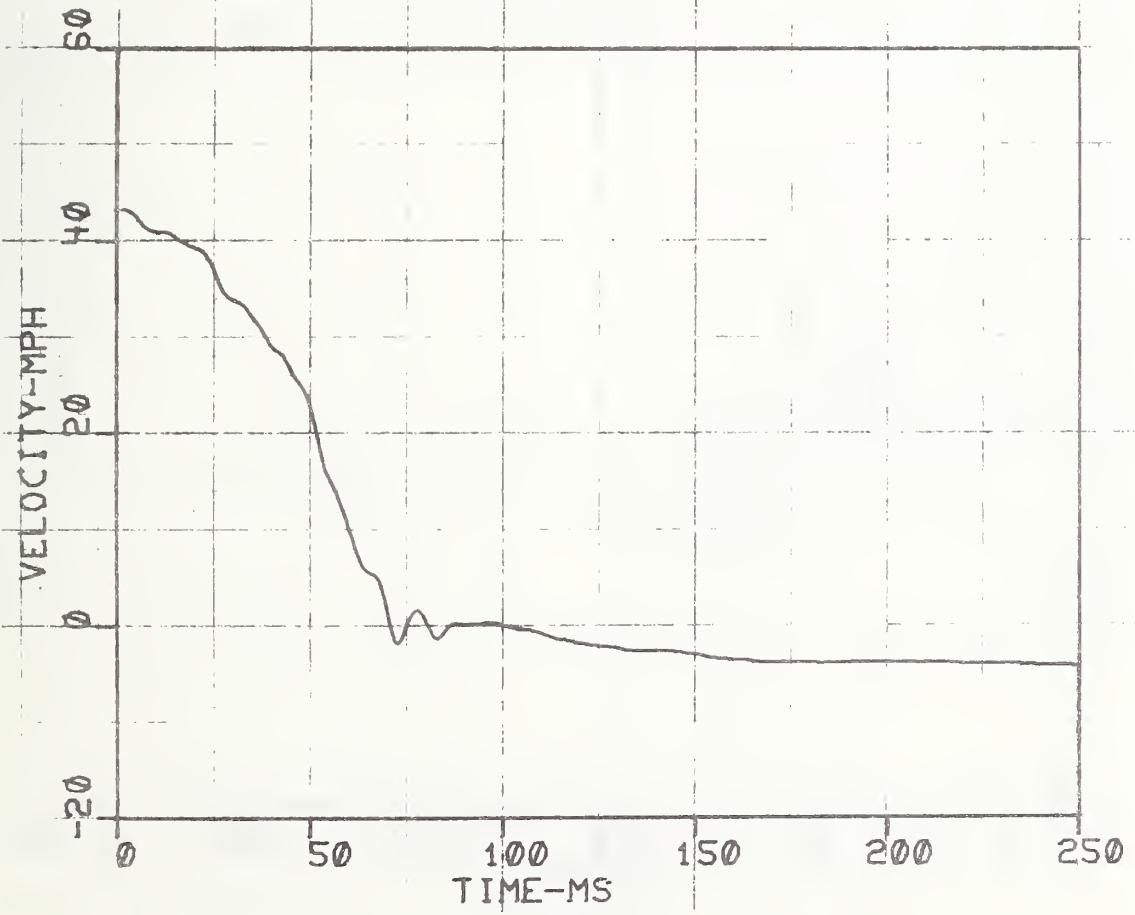
TEST#3108-1 MINICARS RSV LOC 3X



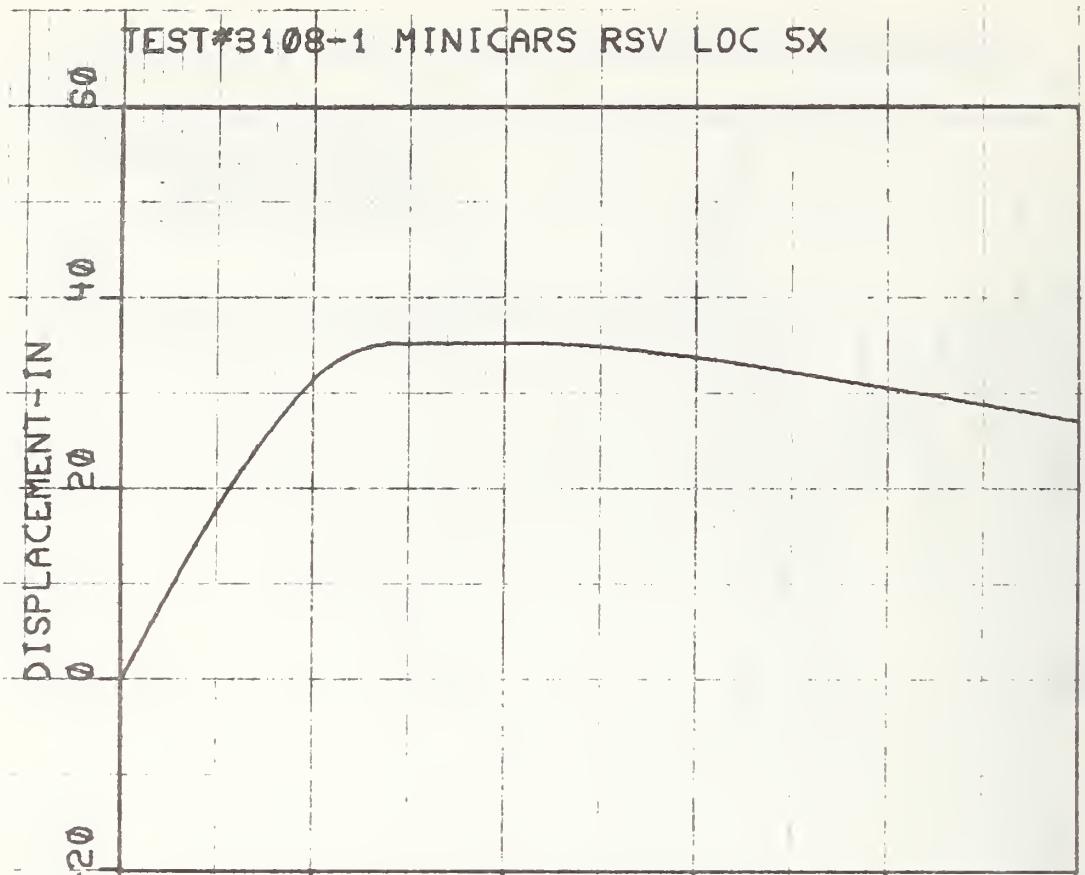
TEST#3108-1 MINICARS RSV LOC SX



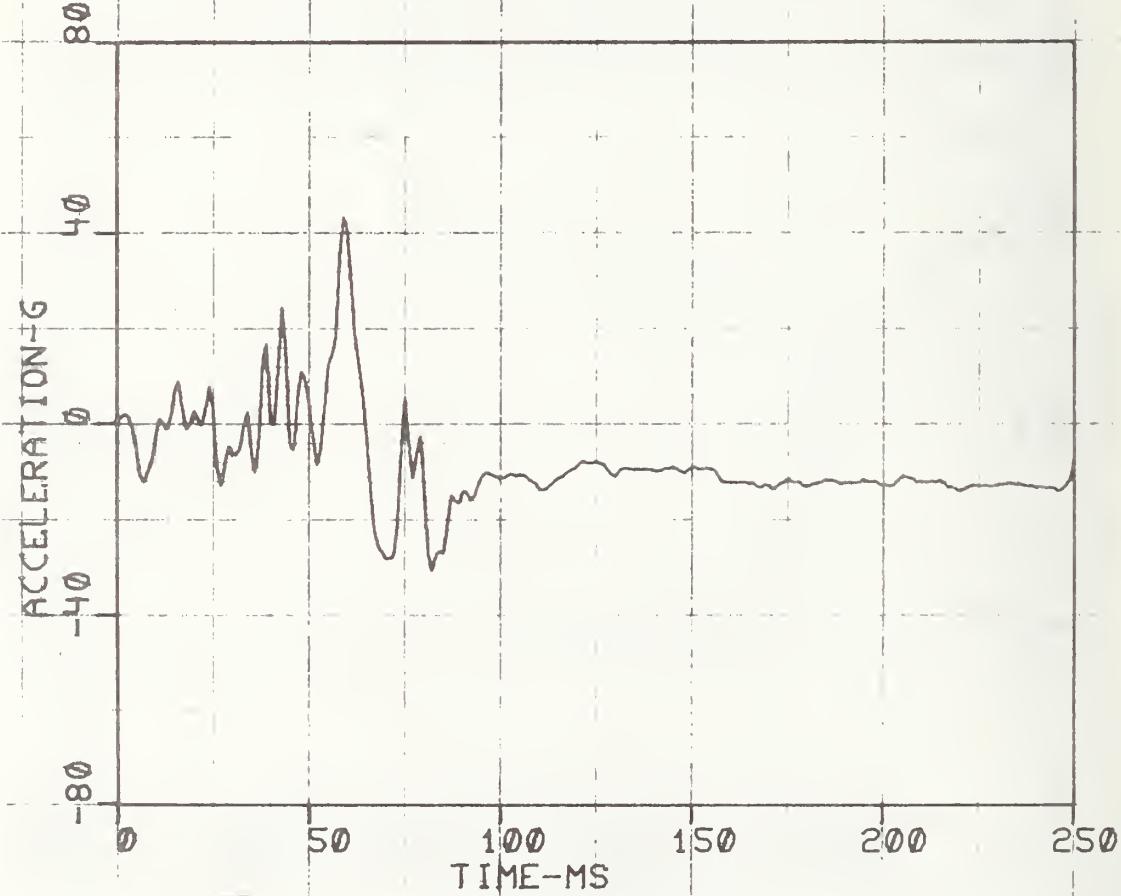
TEST#3108-1 MINICARS RSV LOC SX



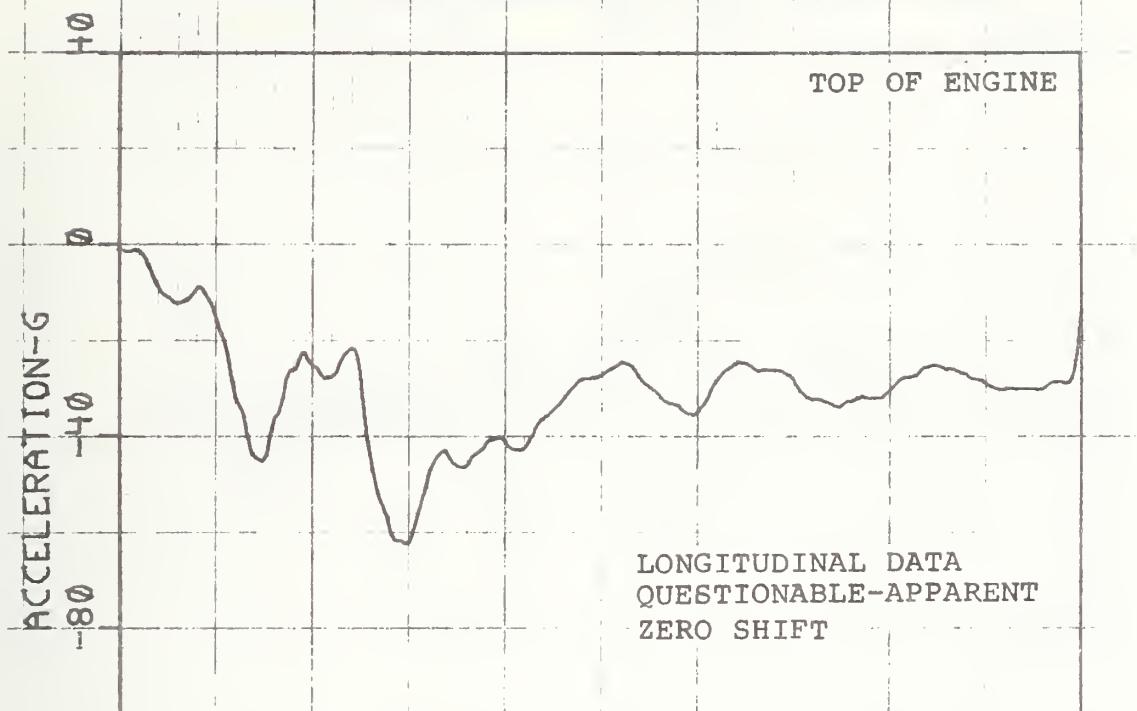
TEST#3108-1 MINICARS RSV LOC 5X



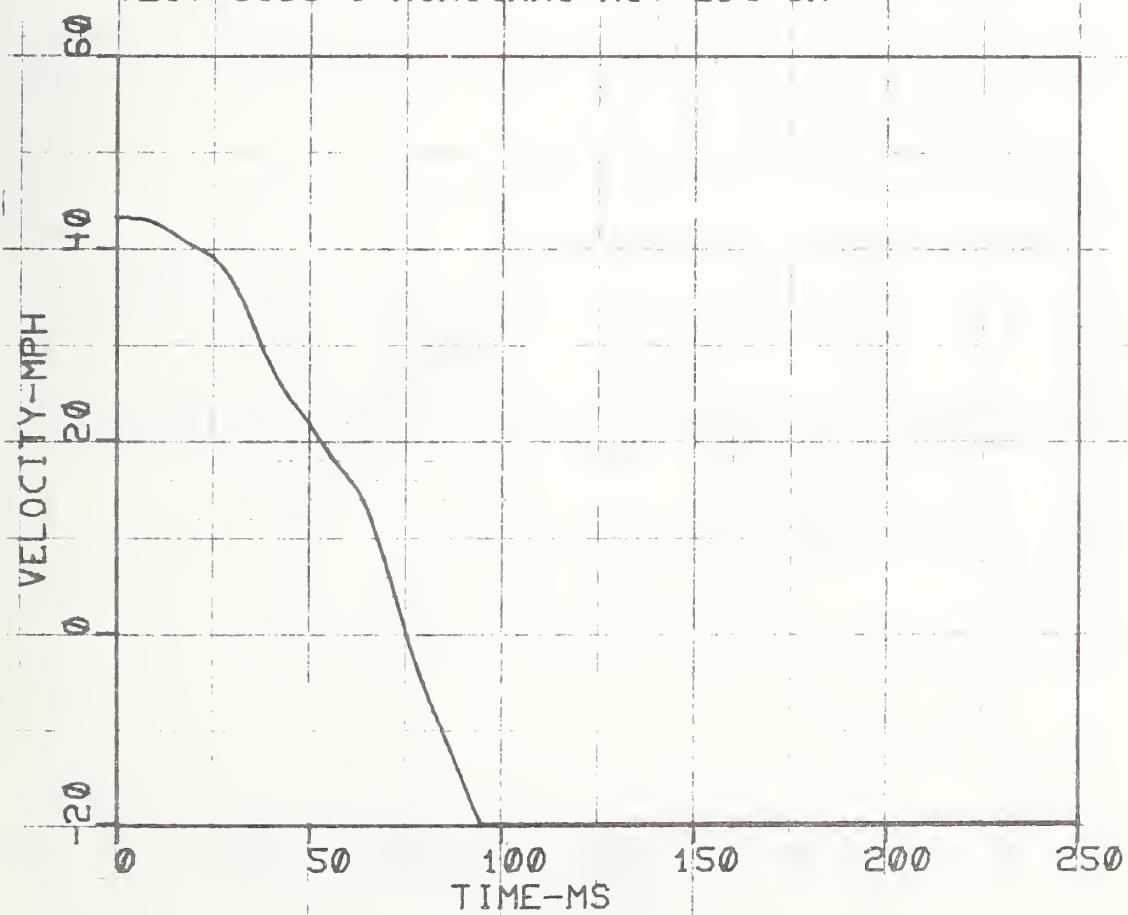
TEST#3108-1 MINICARS RSV LOC 5Z



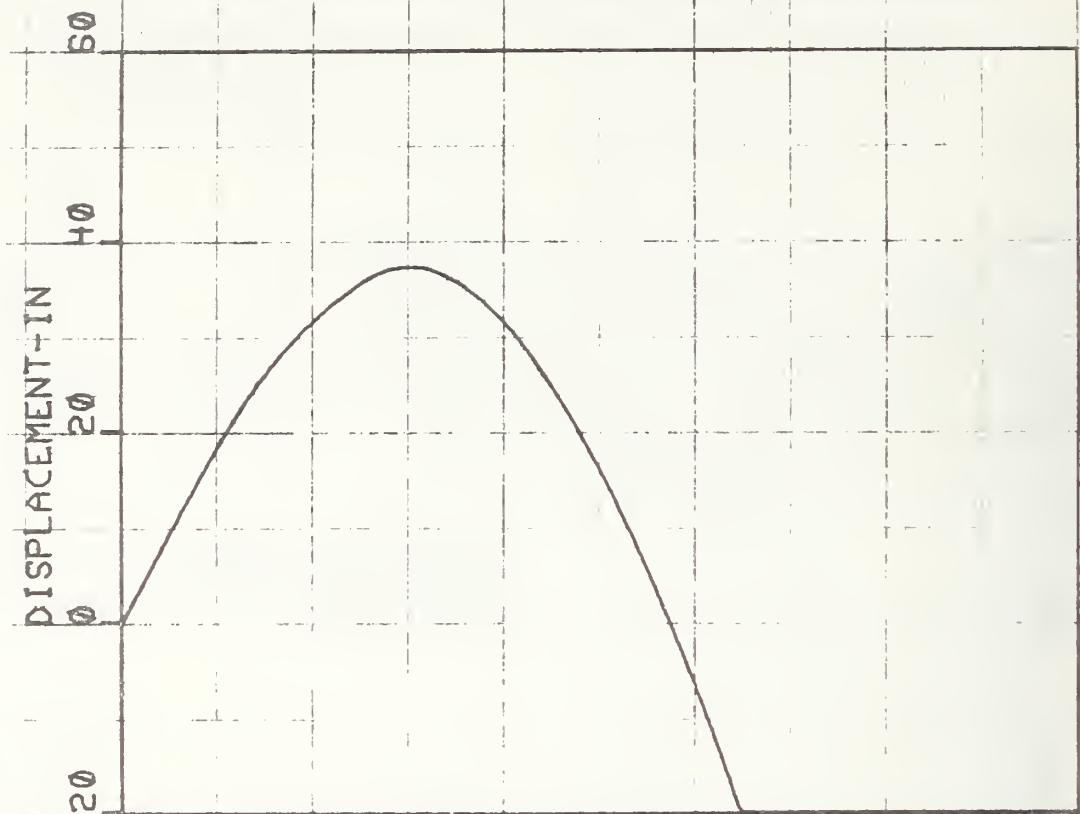
TEST#3108-1 MINICARS RSV LOC 6X



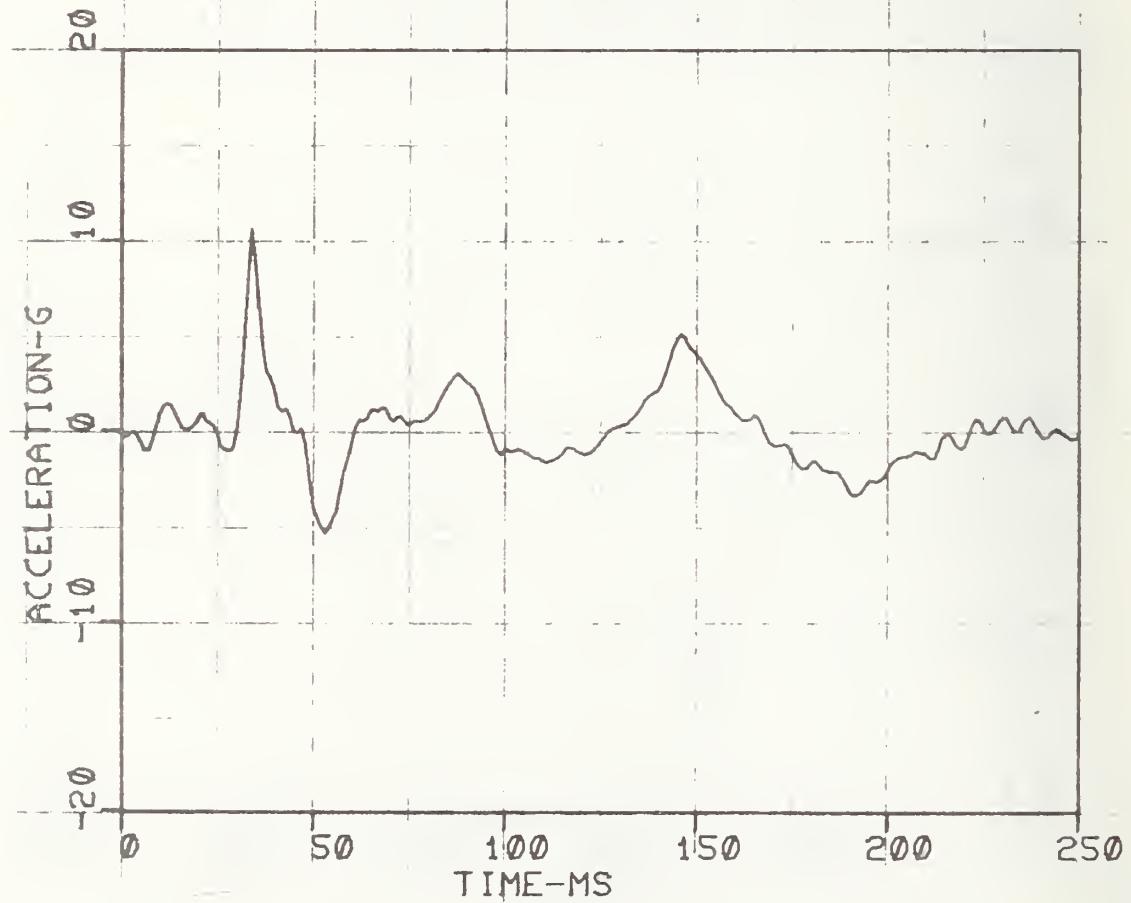
TEST#3108-1 MINICARS RSV LOC 6X

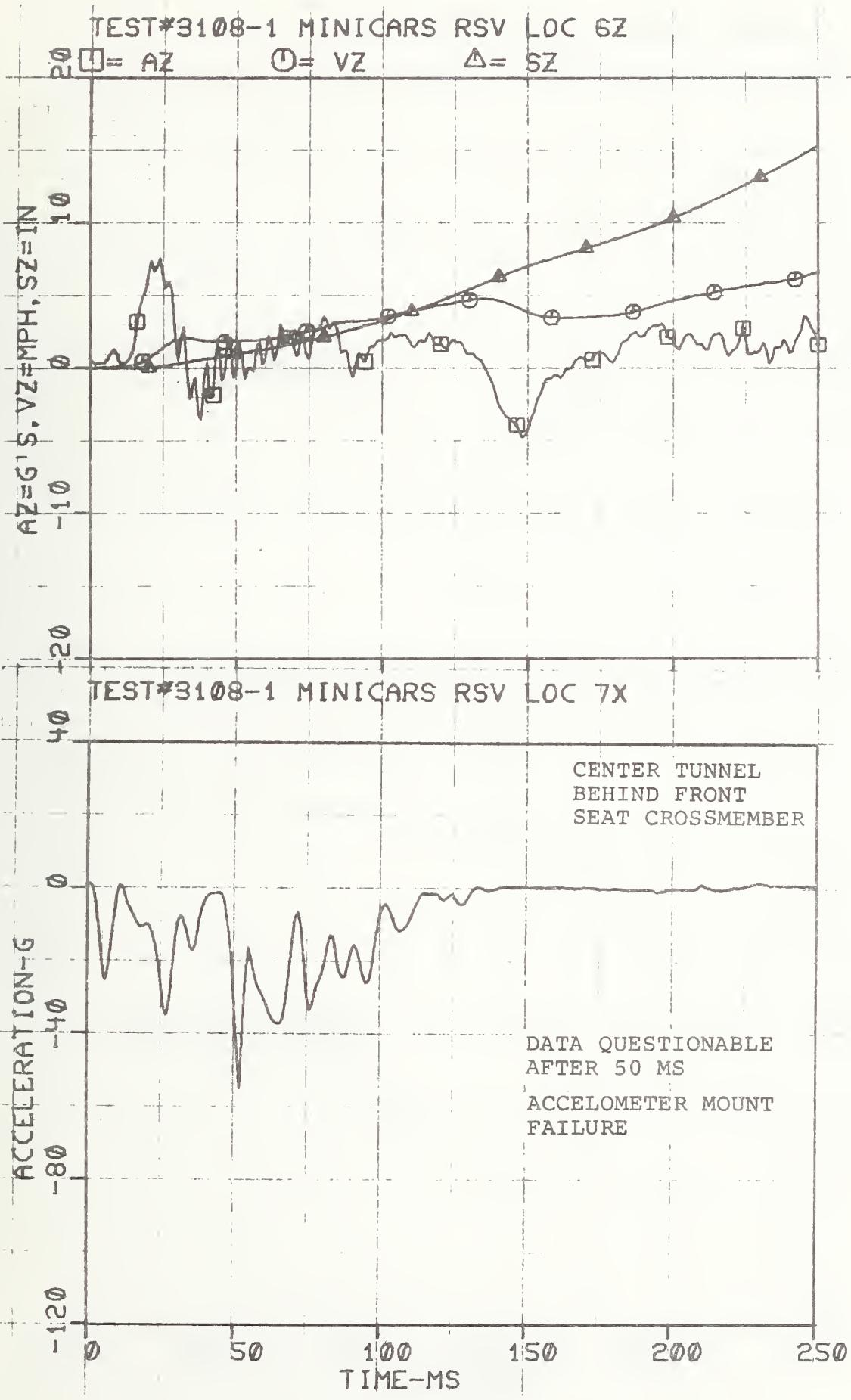


TEST#3108-1 MINICARS RSV LOC 6X

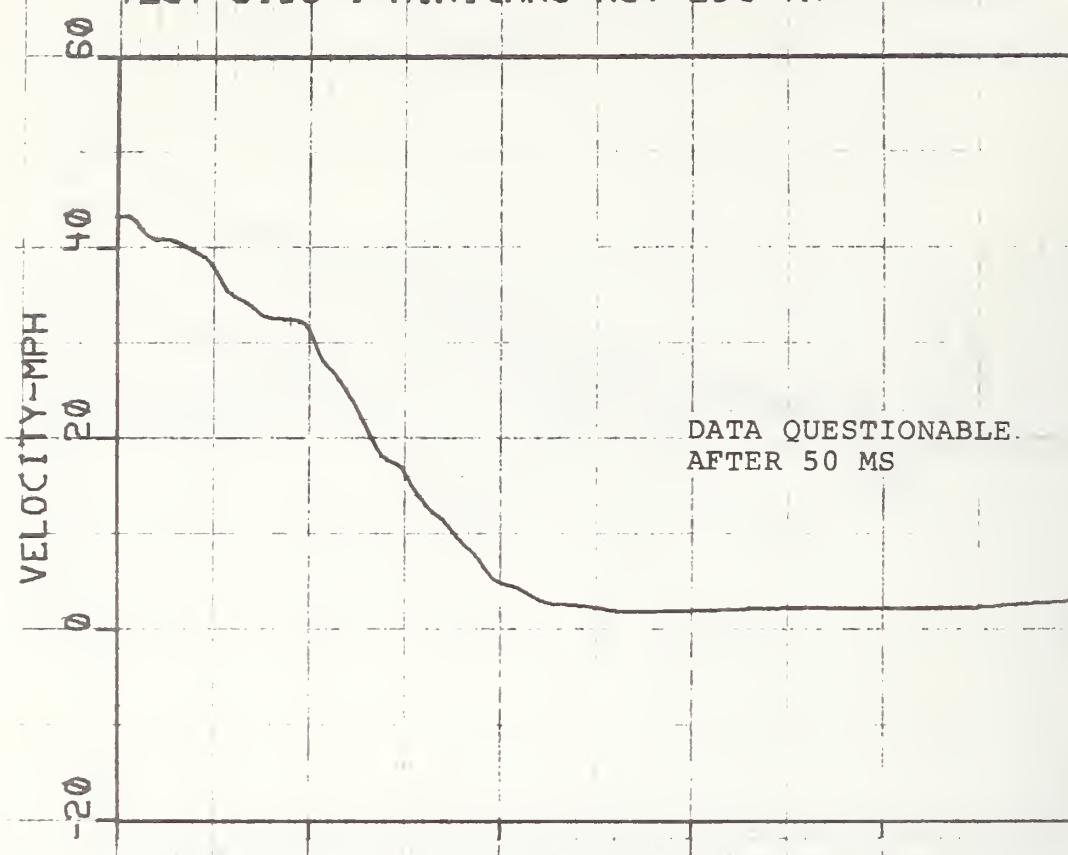


TEST#3108-1 MINICARS RSV LOC 6Y

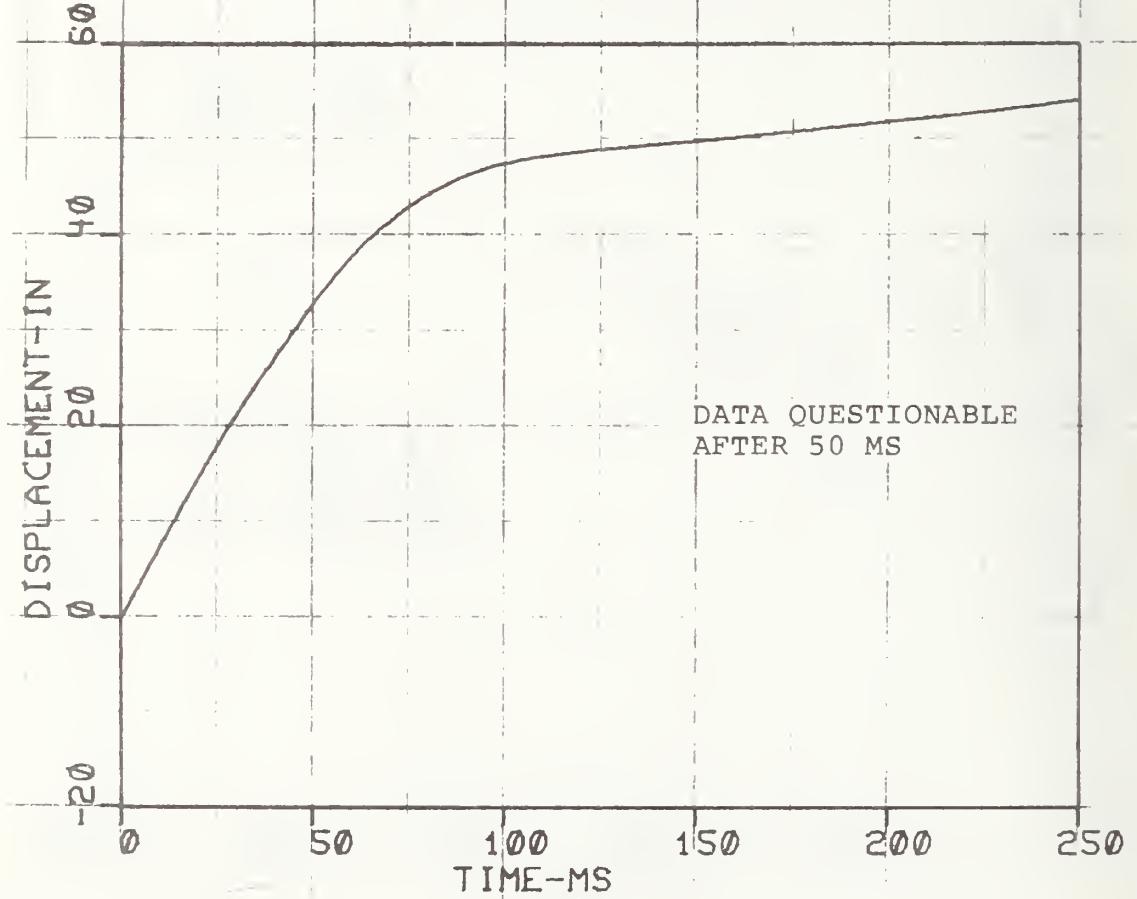


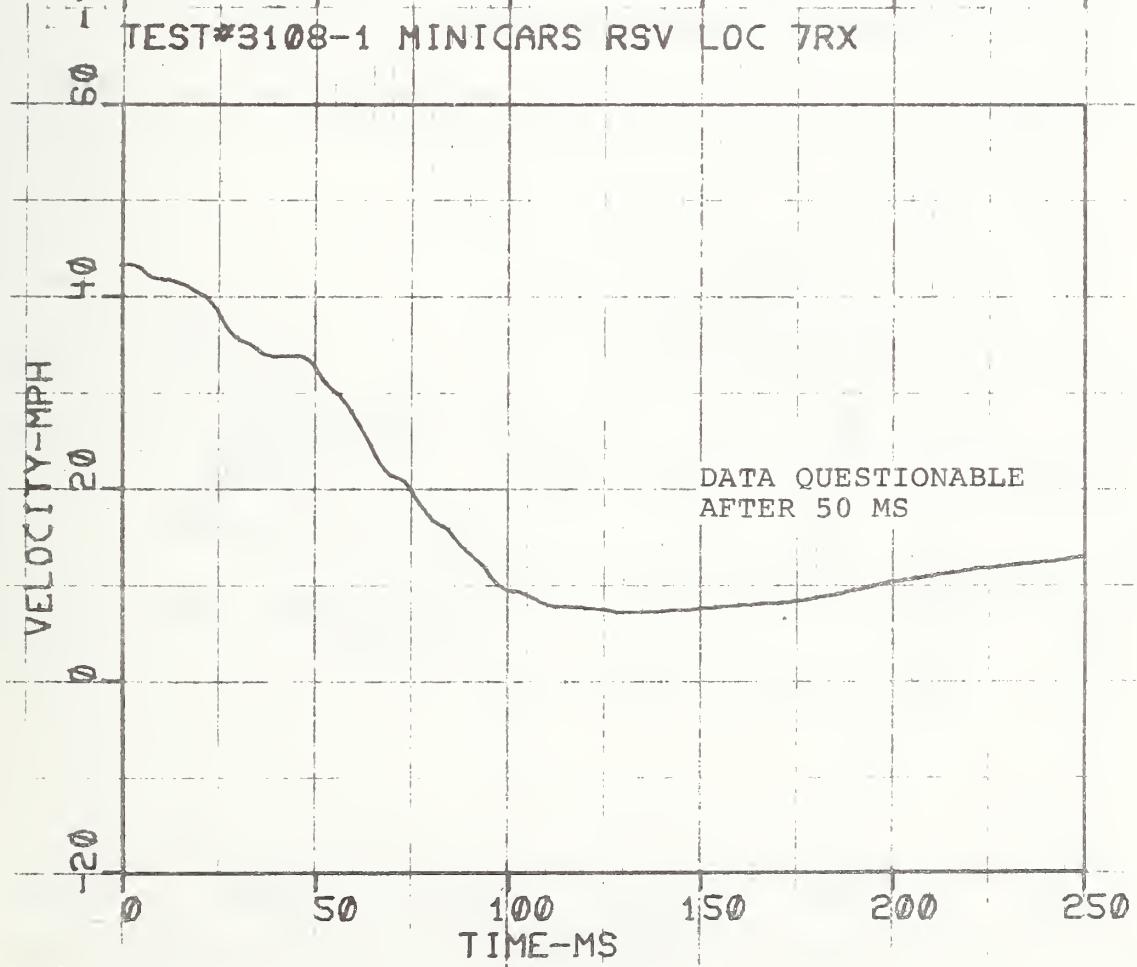
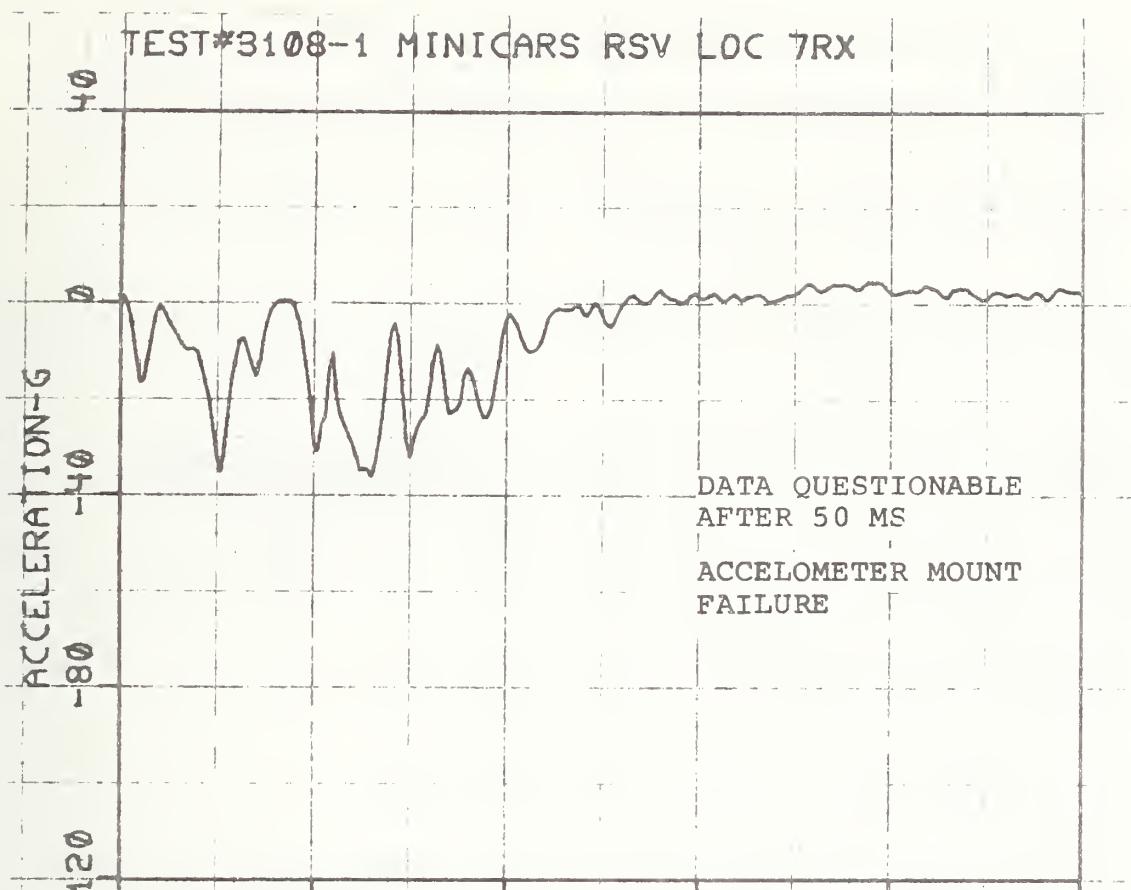


TEST#3108-1 MINICARS RSV LOC 7X

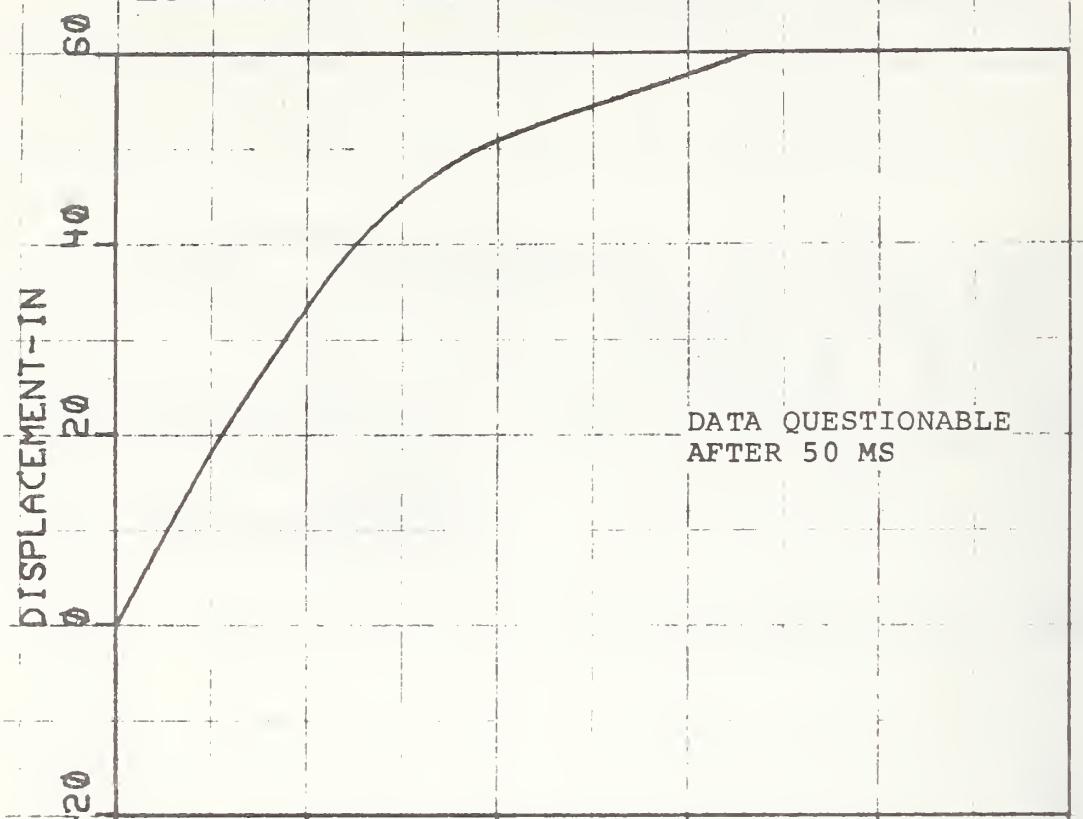


TEST#3108-1 MINICARS RSV LOC 7X

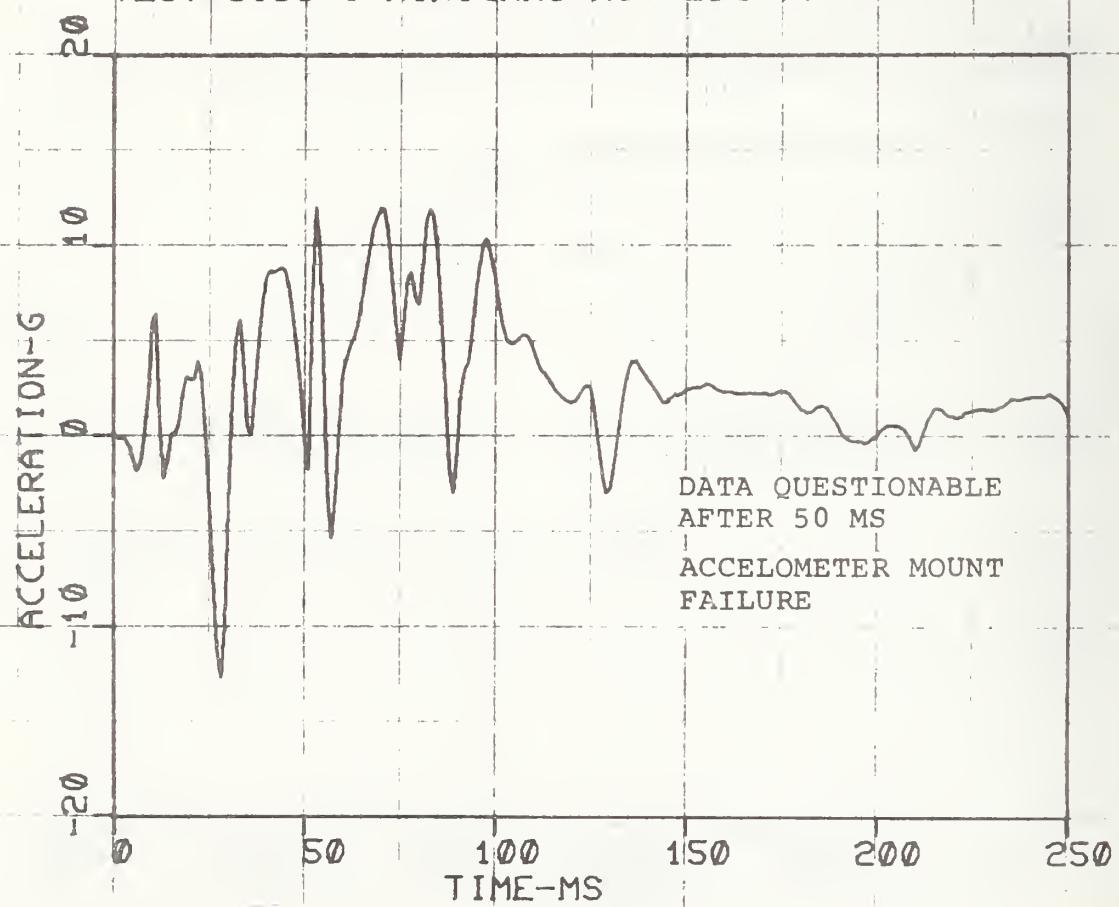




TEST#3108-1 MINICARS RSV LOC 7RX

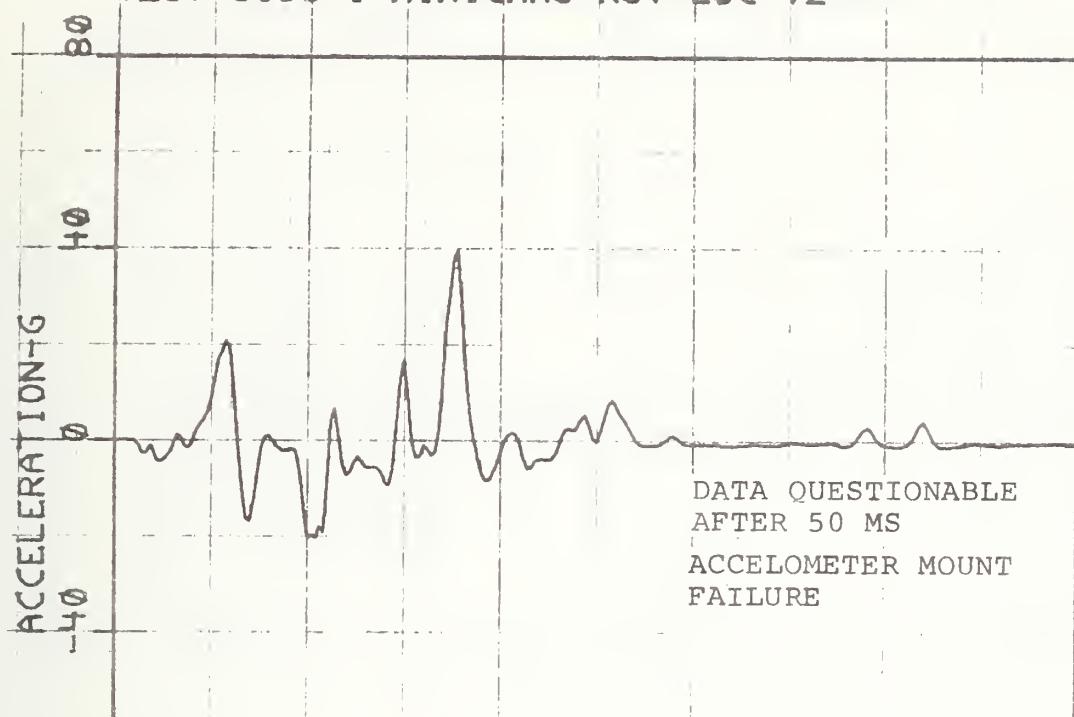


TEST#3108-1 MINICARS RSV LOC 7Y

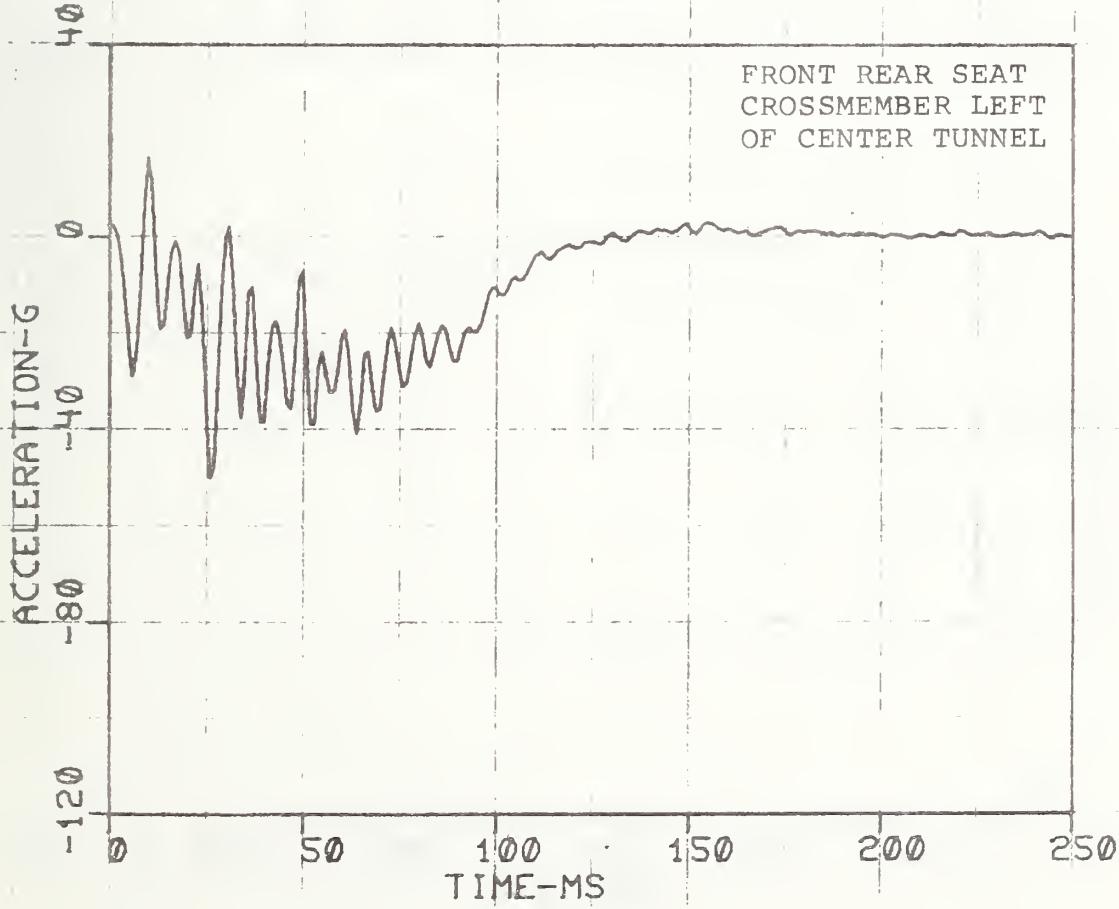


TIME-MS

TEST#3108-1 MINICARS RSV LOC 7Z



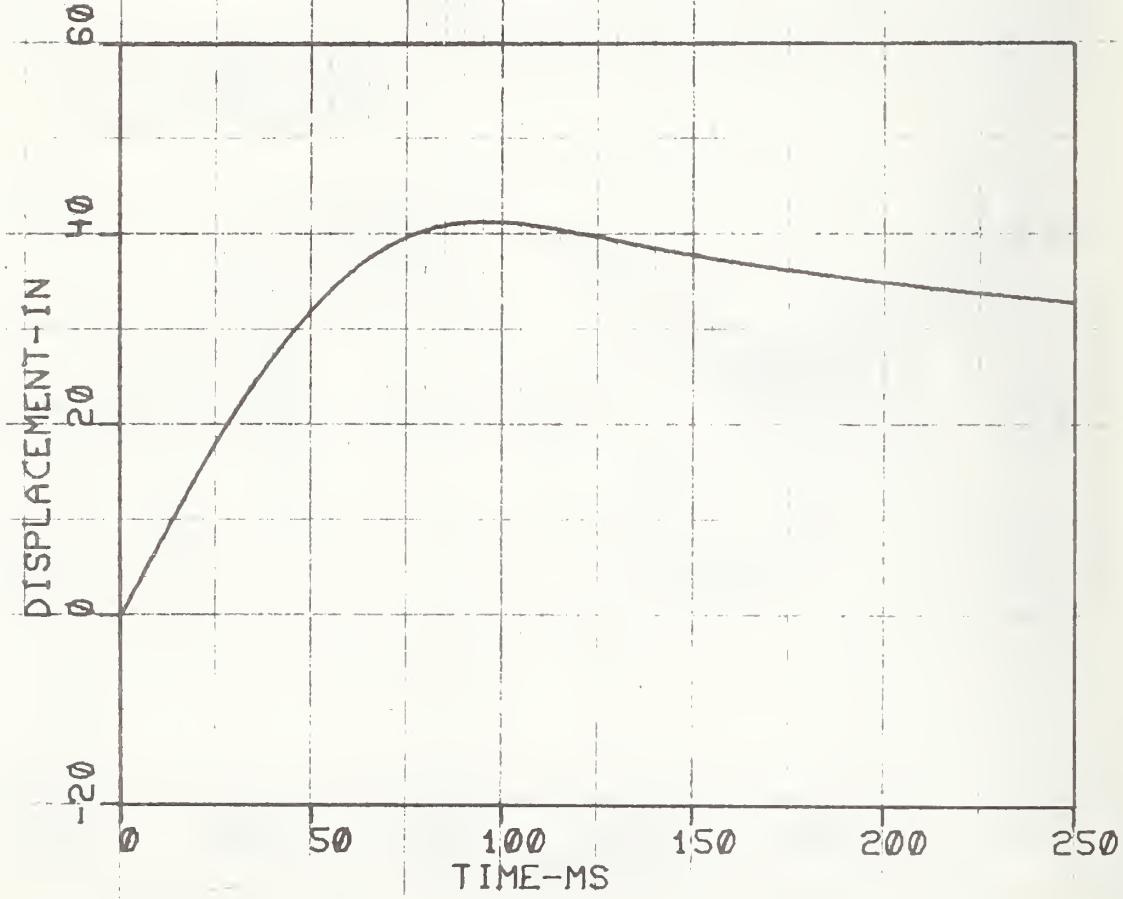
TEST#3108-1 MINICARS RSV LOC 8X

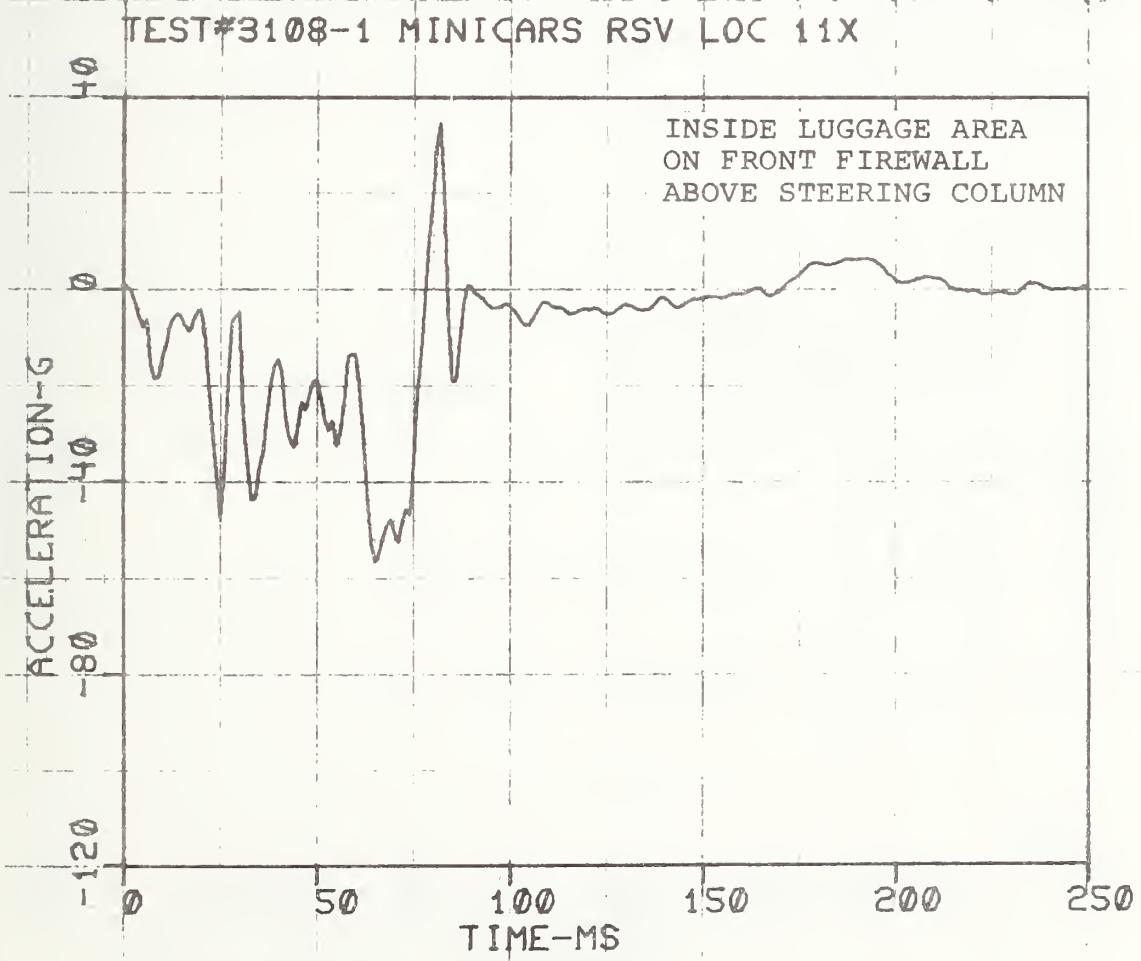
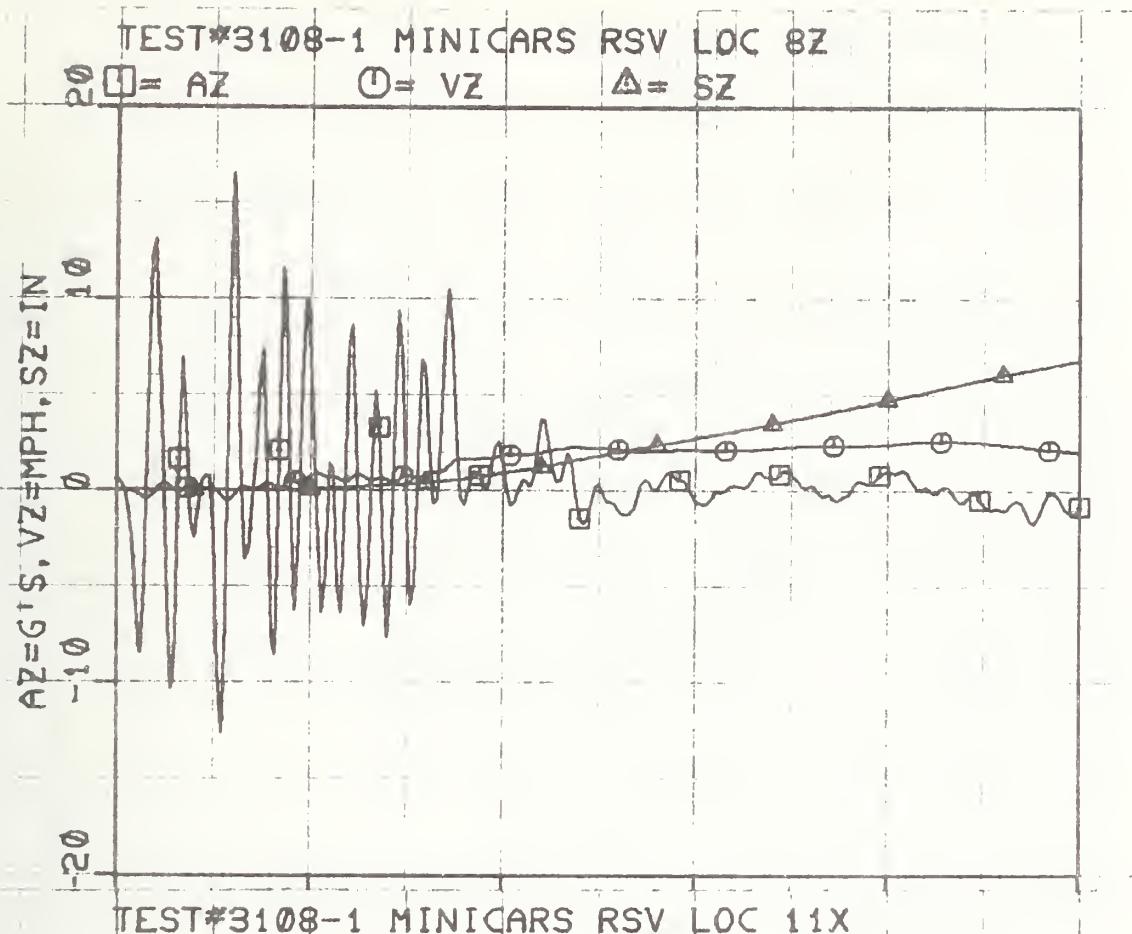


TEST#3108-1 MINICARS RSV LOC 8X

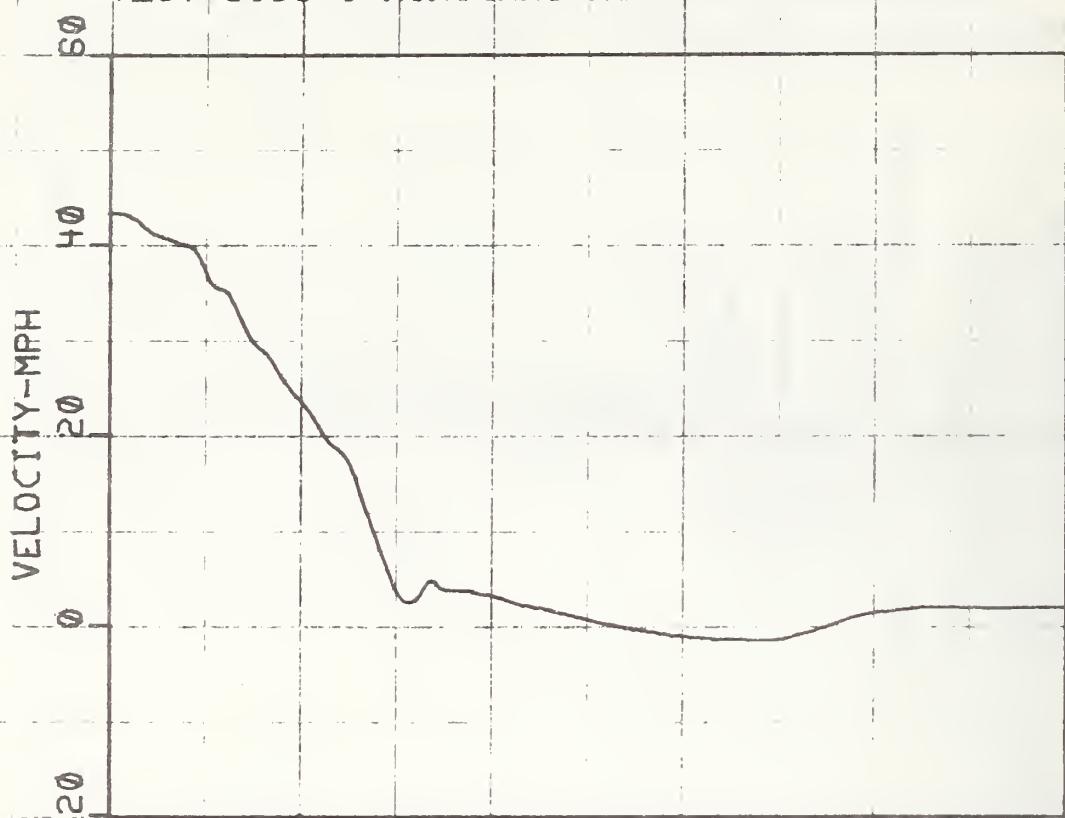


TEST#3108-1 MINICARS RSV LOC 8X

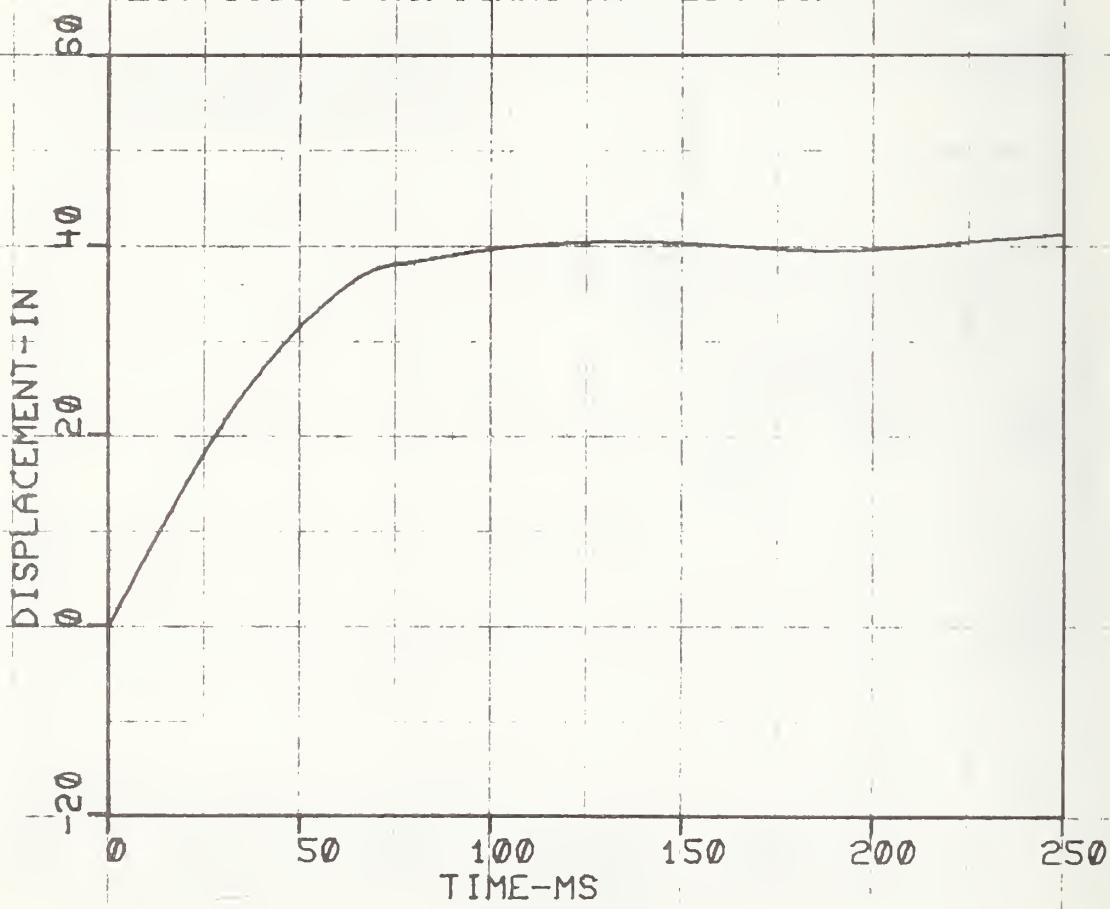




TEST#3108-1 MINICARS RSV LOC 11X



TEST#3108-1 MINICARS RSV LOC 11X

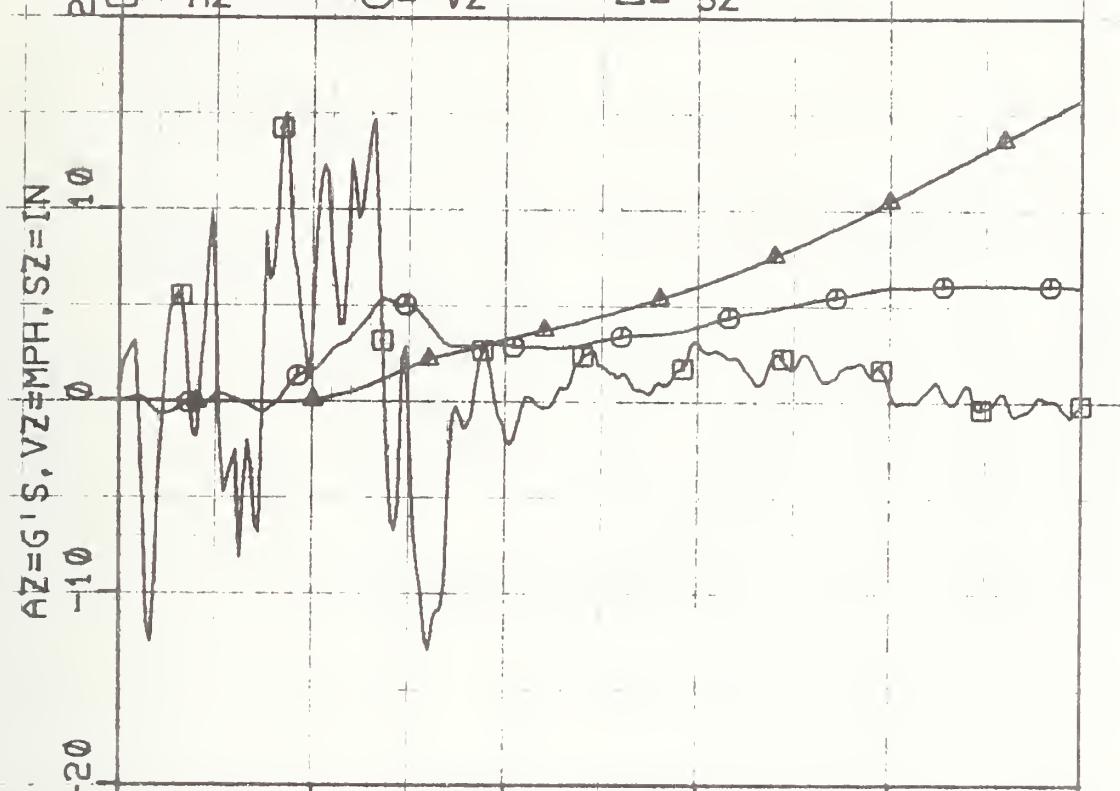


TEST#3108-1 MINICARS RSV LOC 11Z

□ = AZ

○ = VZ

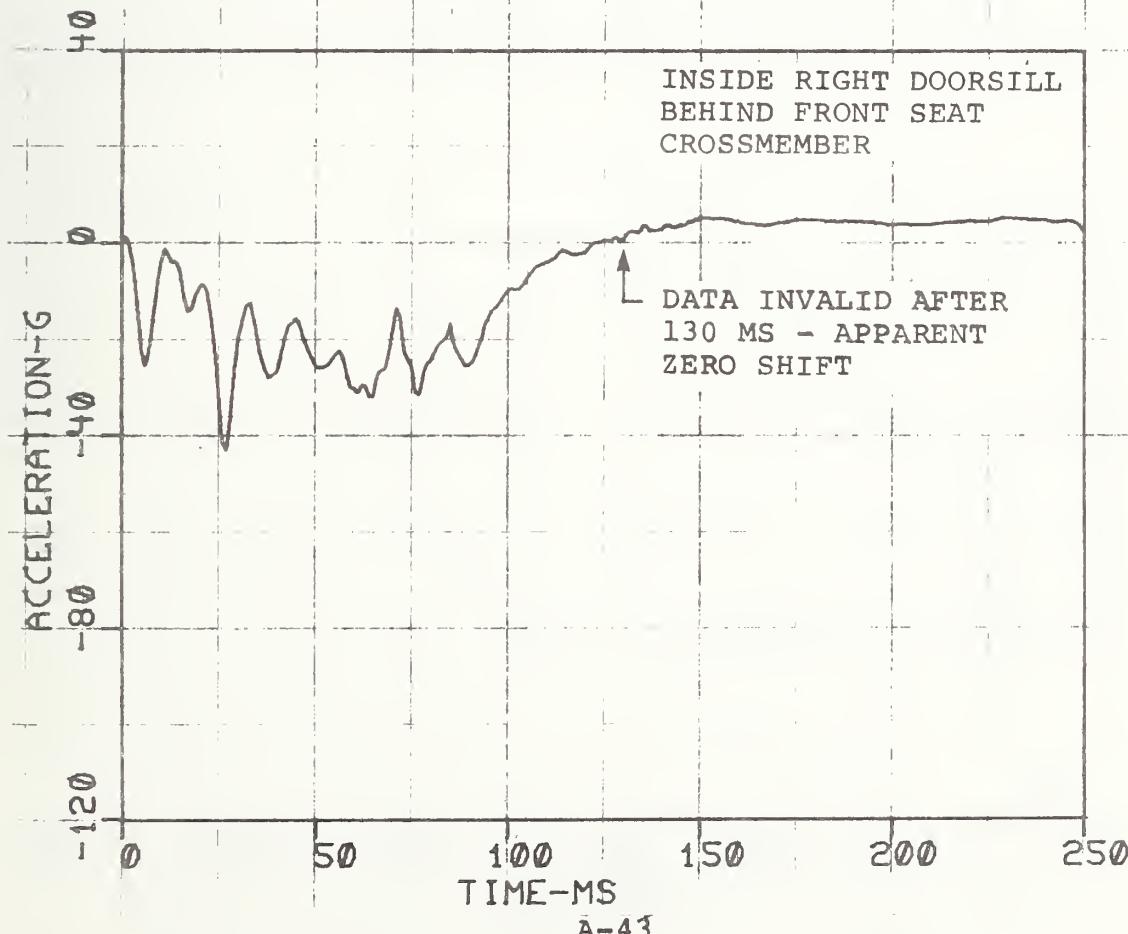
△ = SZ



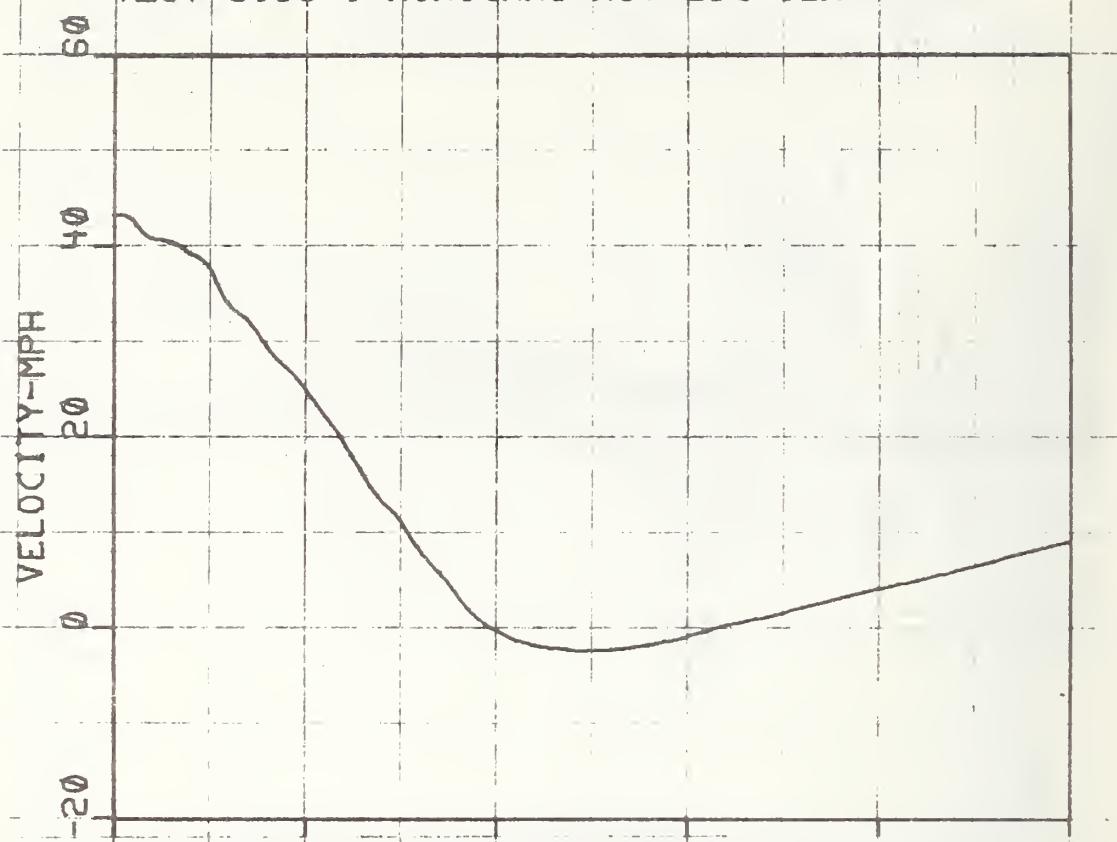
TEST#3108-1 MINICARS RSV LOC 12X

INSIDE RIGHT DOORSILL
BEHIND FRONT SEAT
CROSSMEMBER

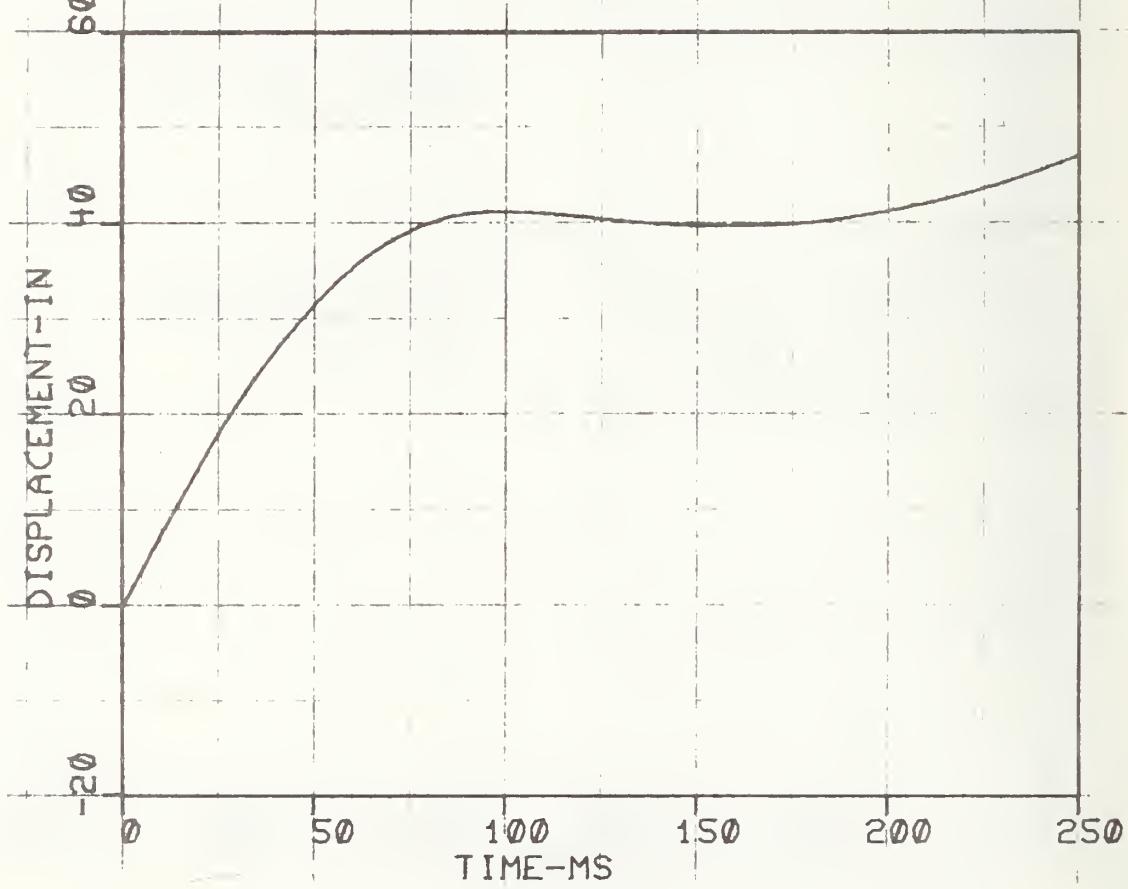
DATA INVALID AFTER
130 MS - APPARENT
ZERO SHIFT



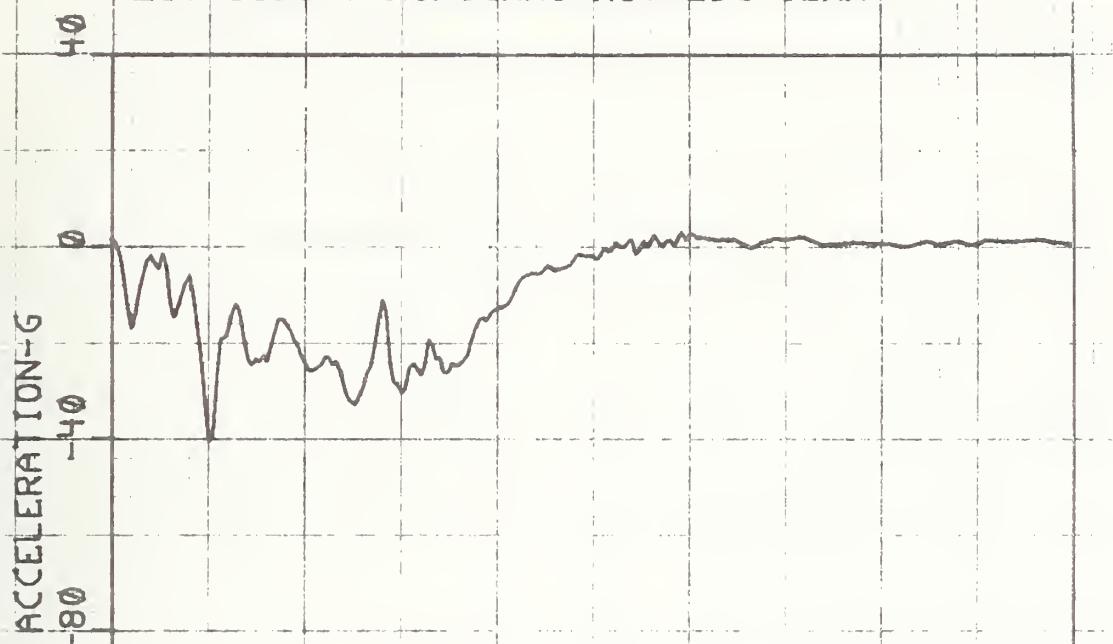
TEST#3108-1 MINICARS RSV LOC 12X



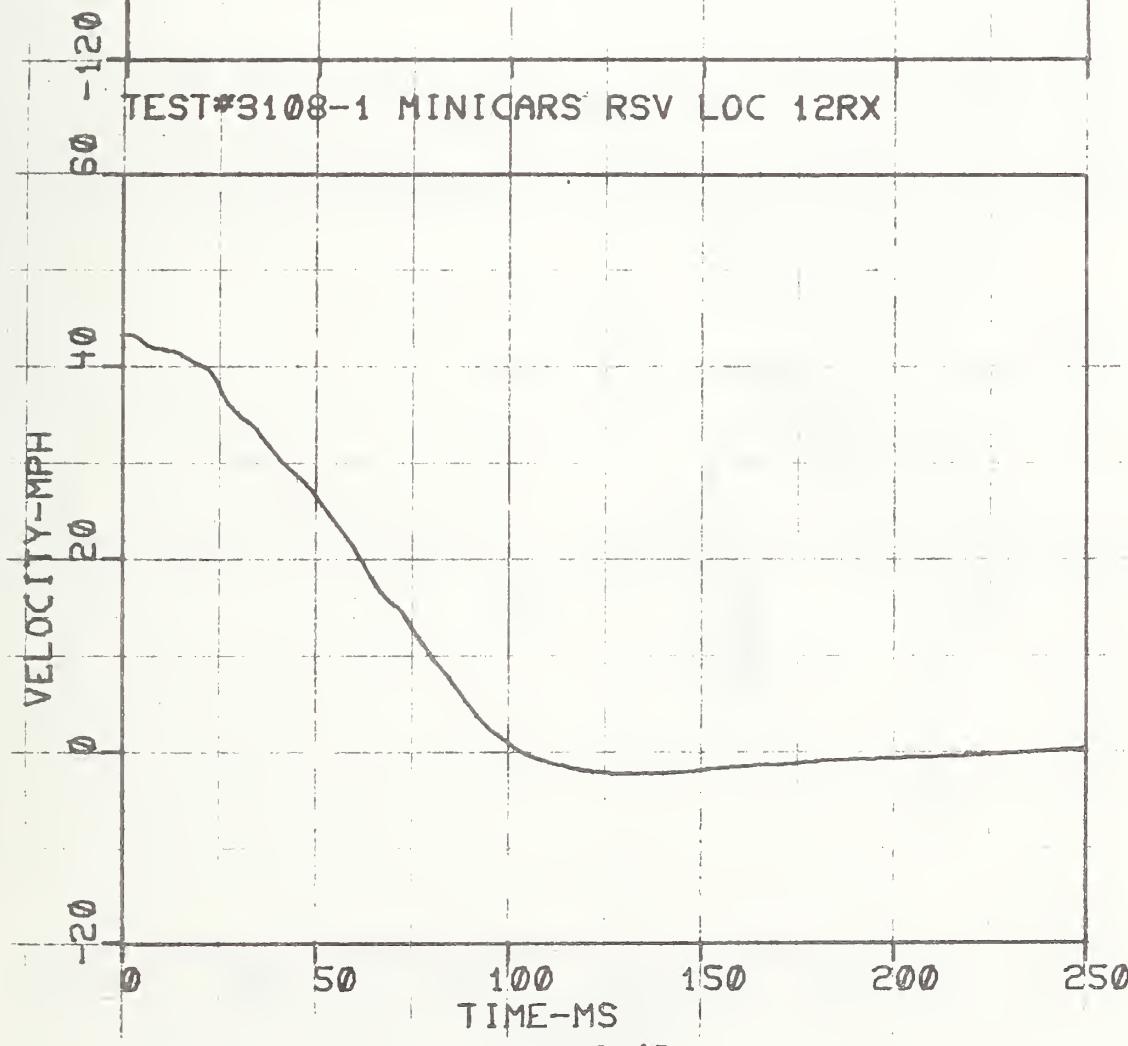
TEST#3108-1 MINICARS RSV LOC 12X



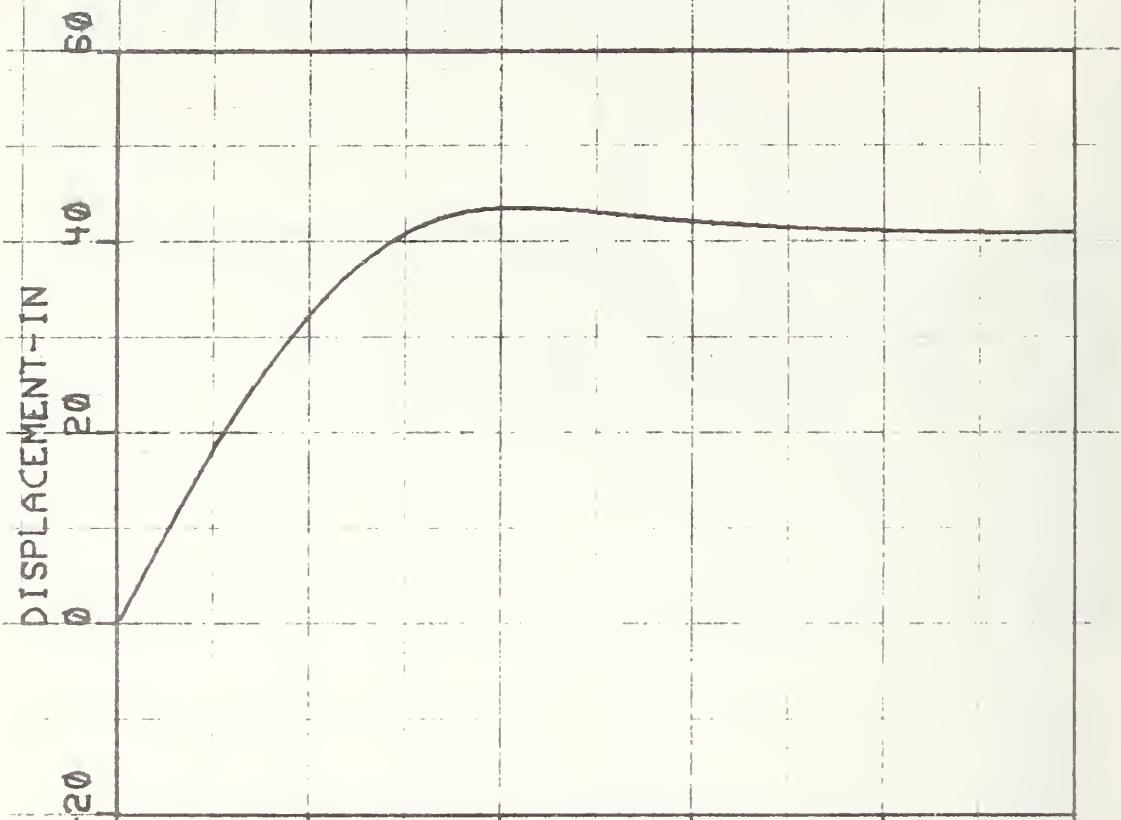
TEST#3108-1 MINICARS RSV LOC 12RX



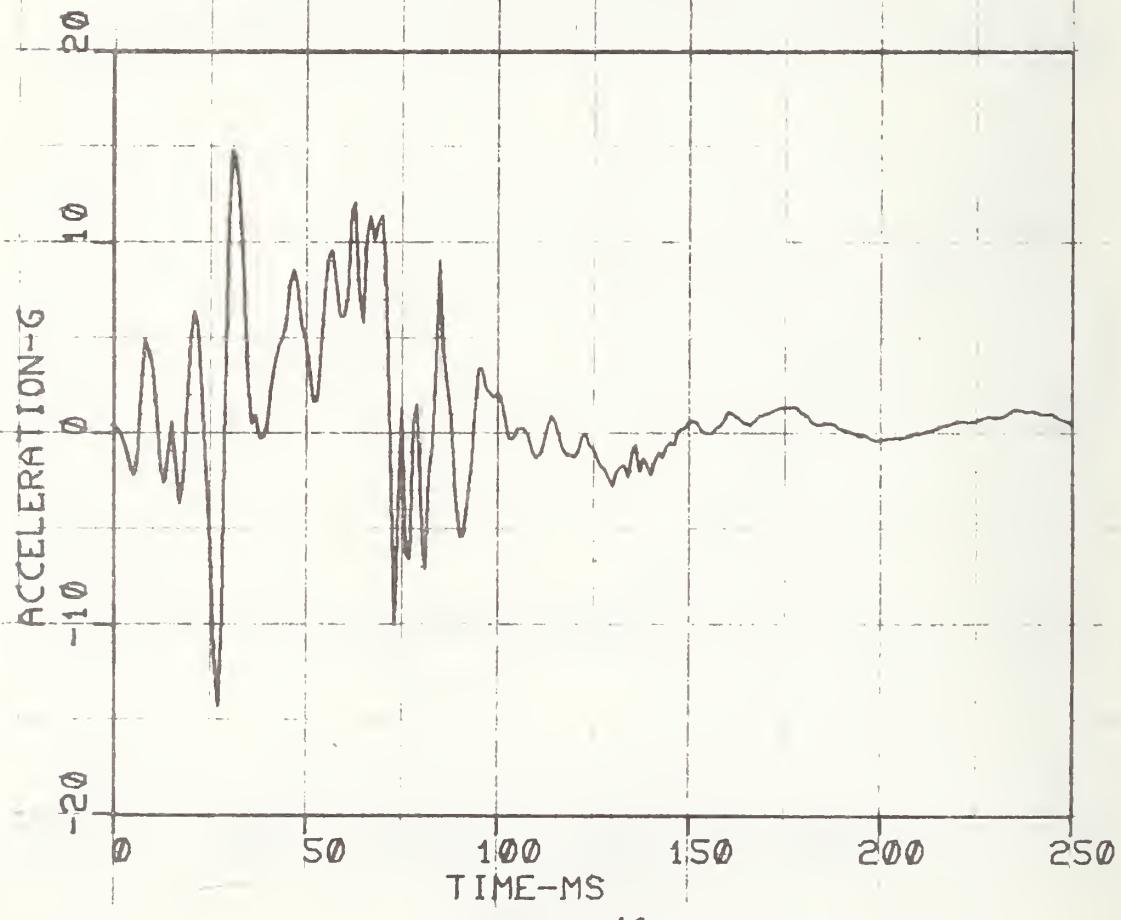
TEST#3108-1 MINICARS RSV LOC 12RX

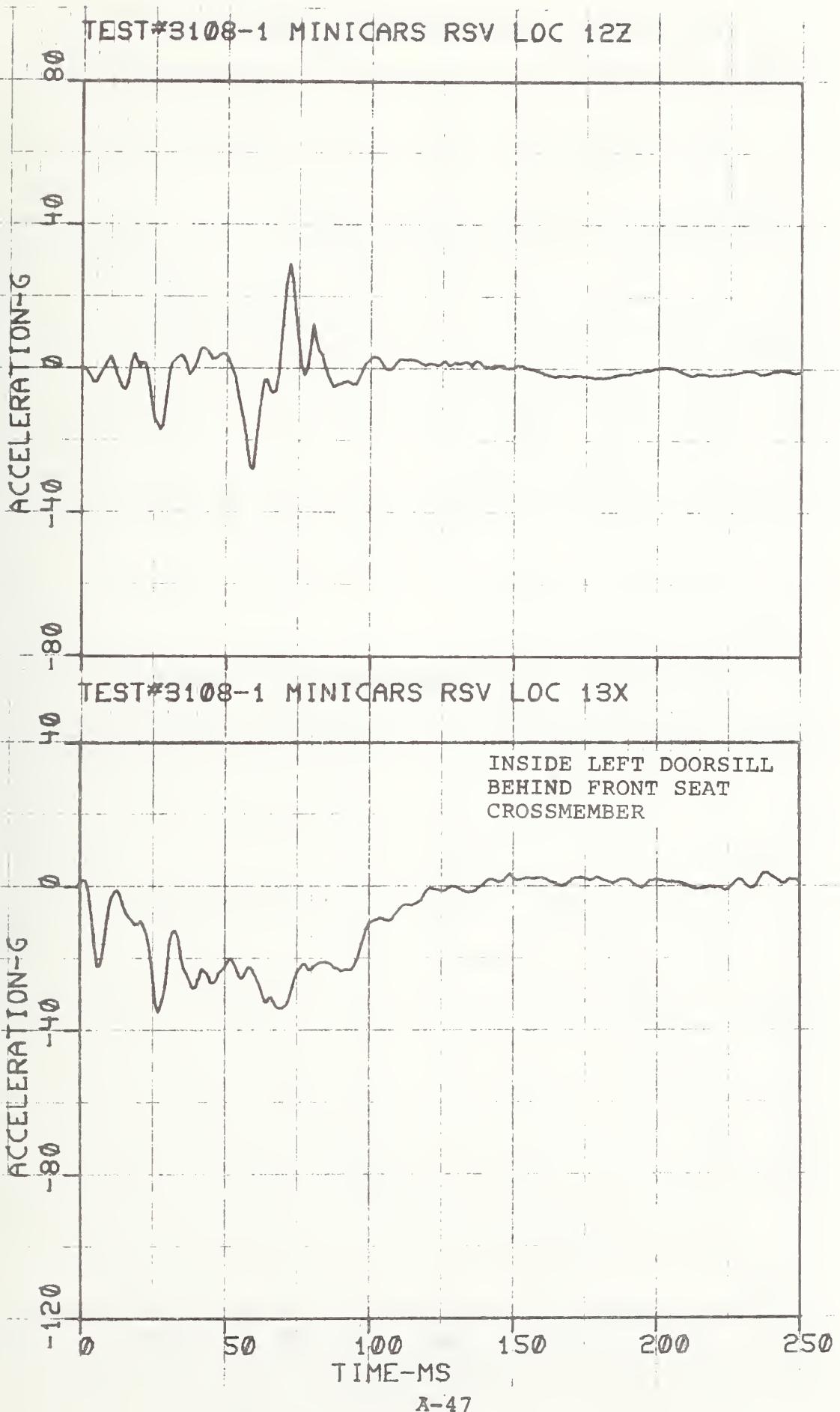


TEST#3108-1 MINICARS RSV LOC 12RX

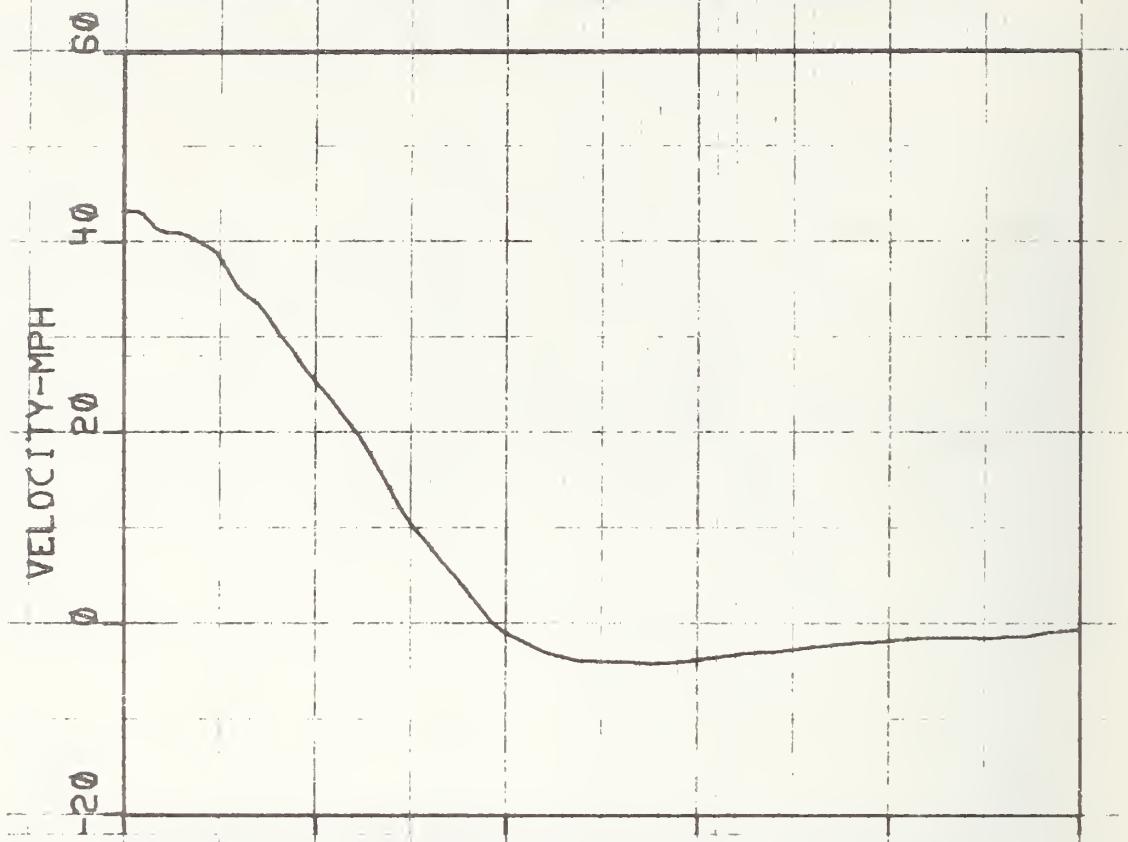


TEST#3108-1 MINICARS RSV LOC 12Y

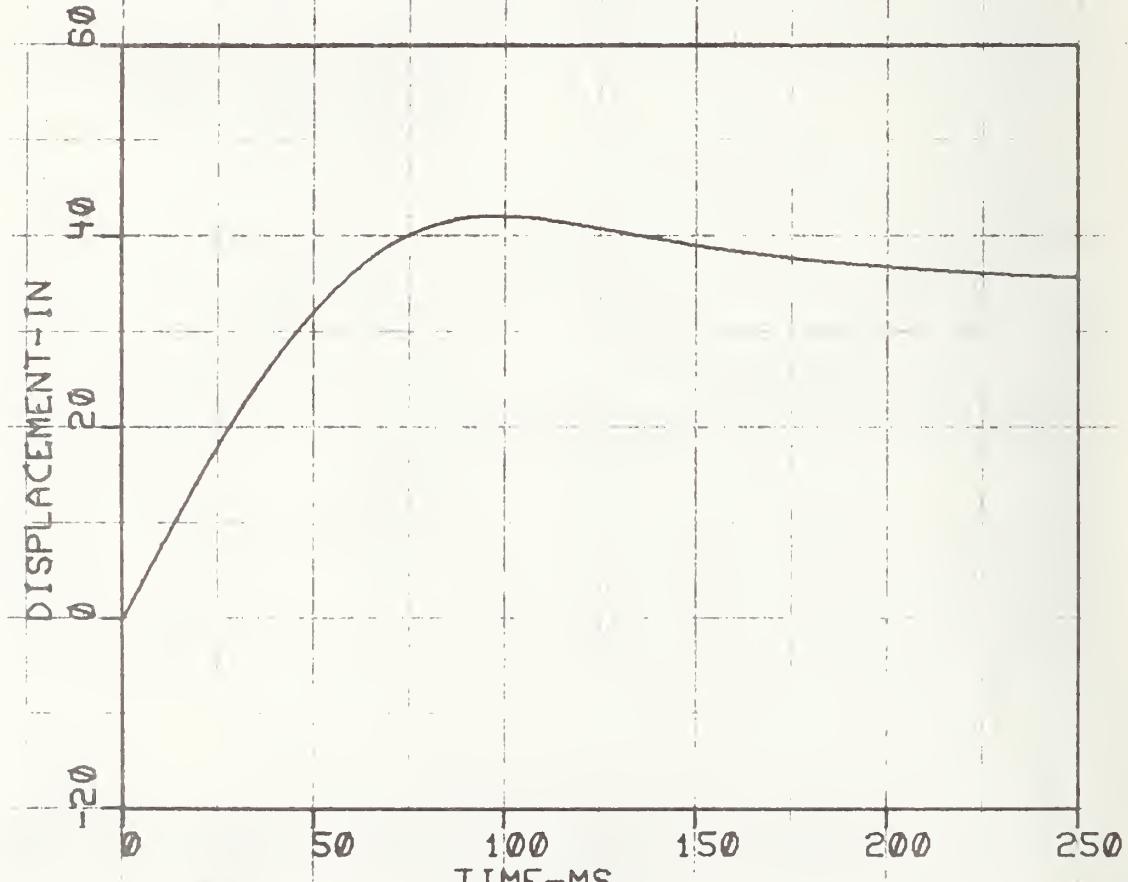




TEST#3108-1 MINICARS RSV LOC 13X



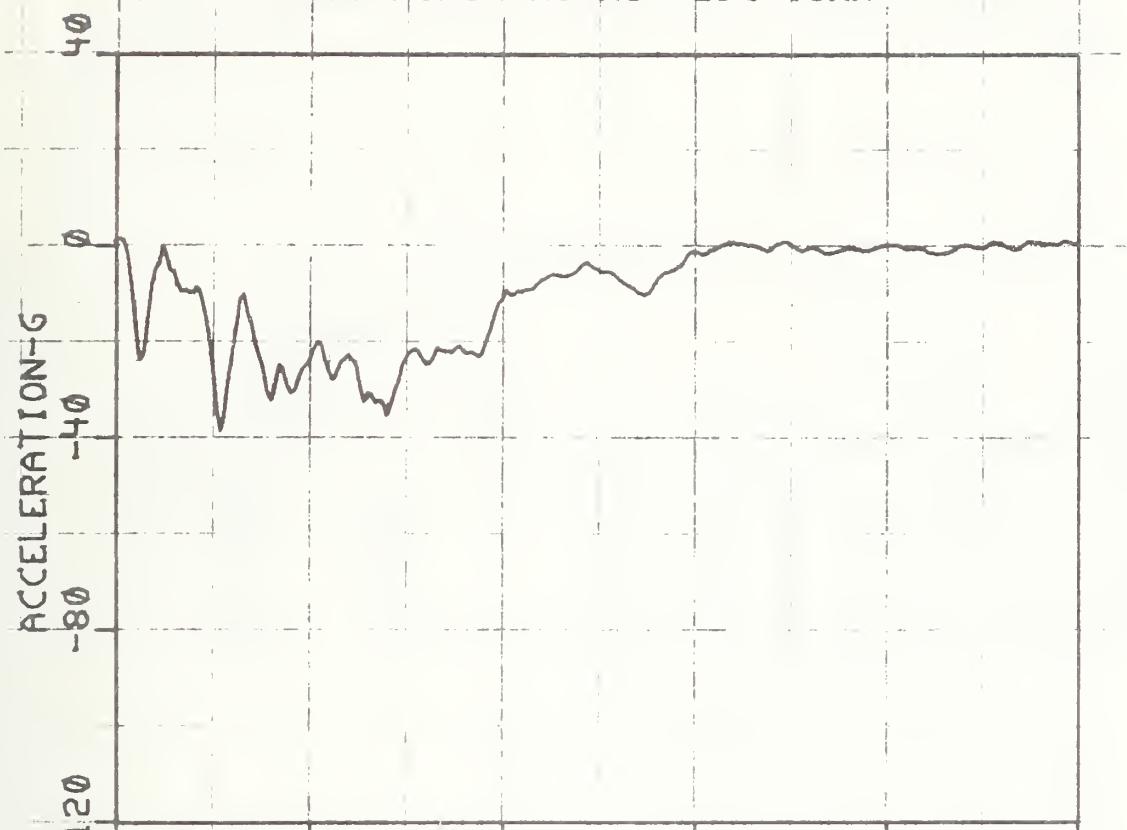
TEST#3108-1 MINICARS RSV LOC 13X



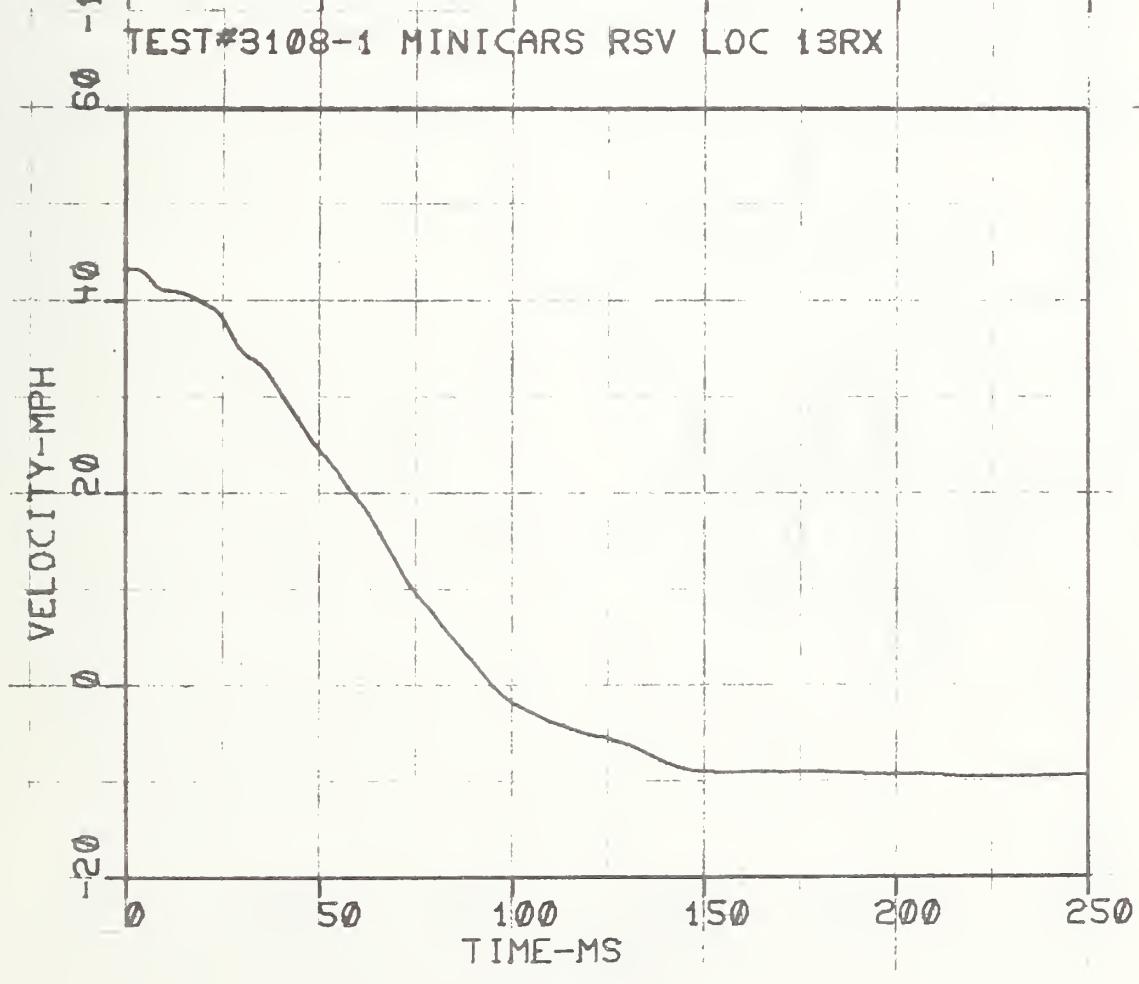
TIME-MS

A-48

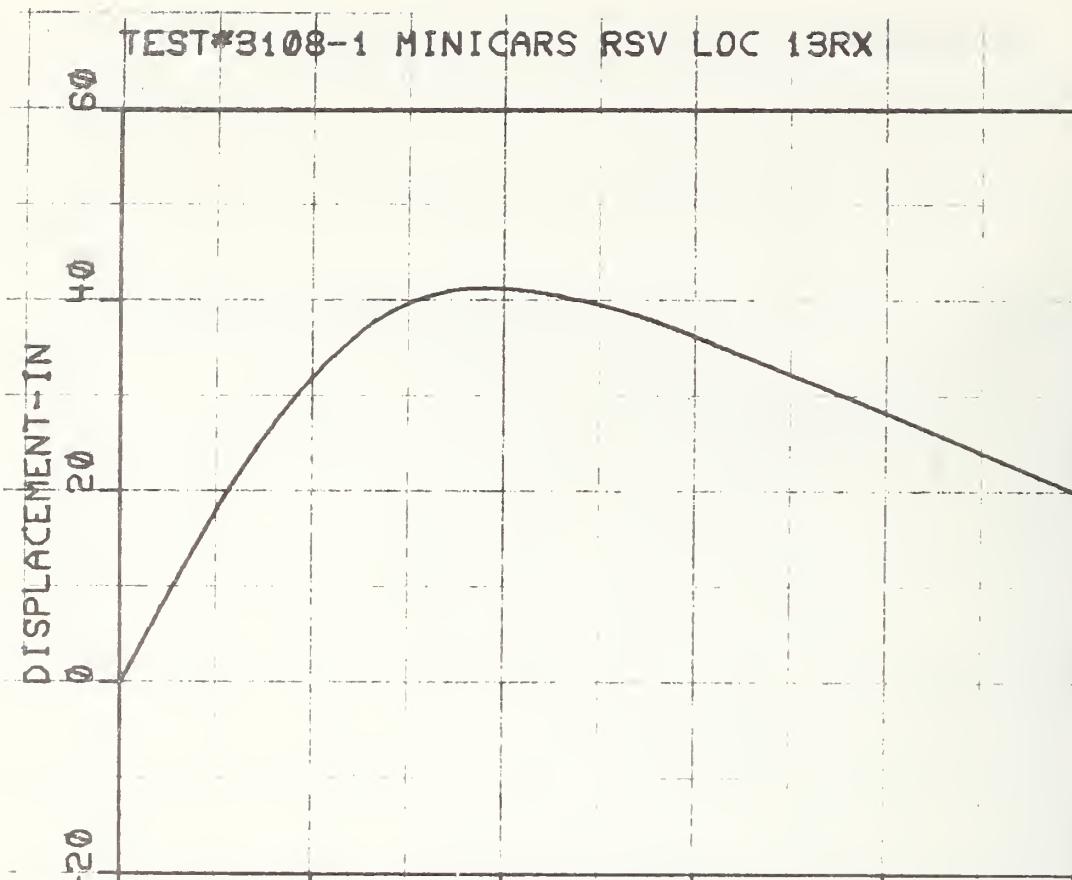
TEST#3108-1 MINICARS RSV LOC 13RX



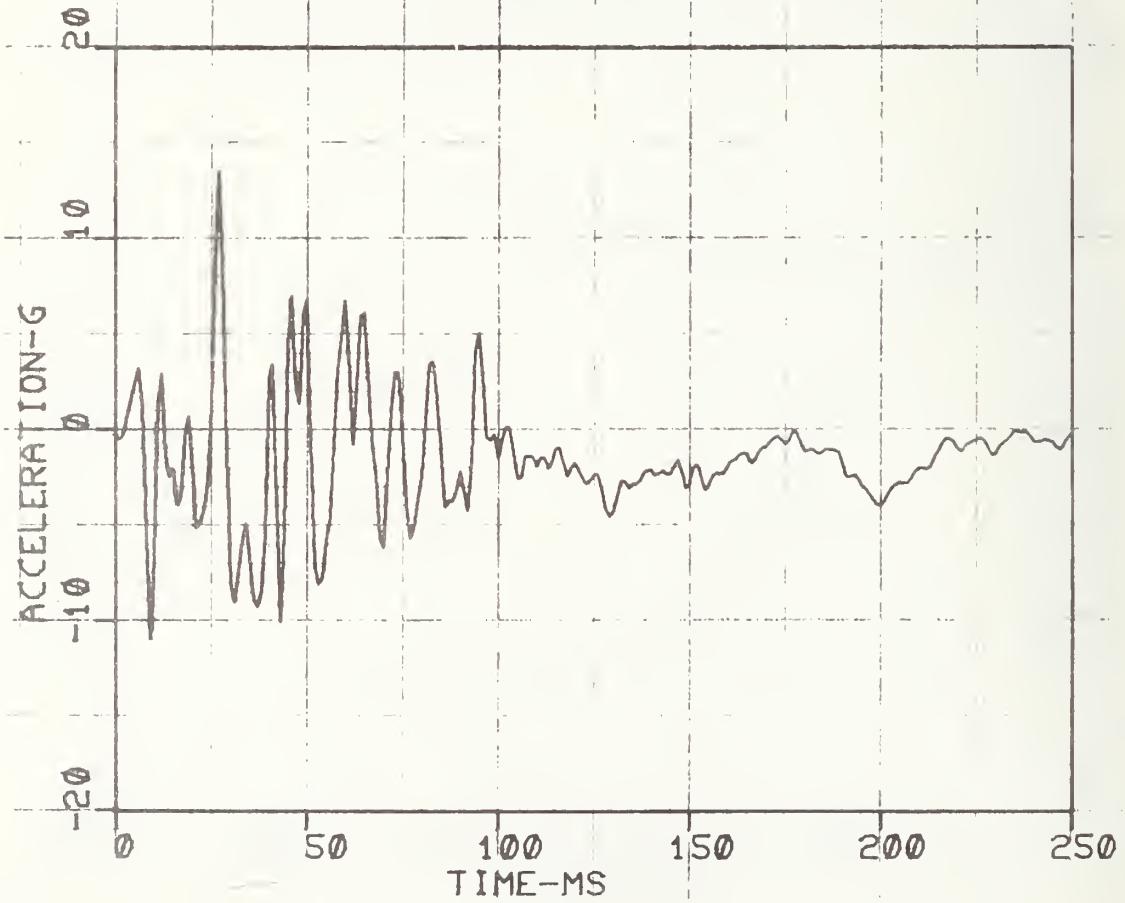
TEST#3108-1 MINICARS RSV LOC 13RX

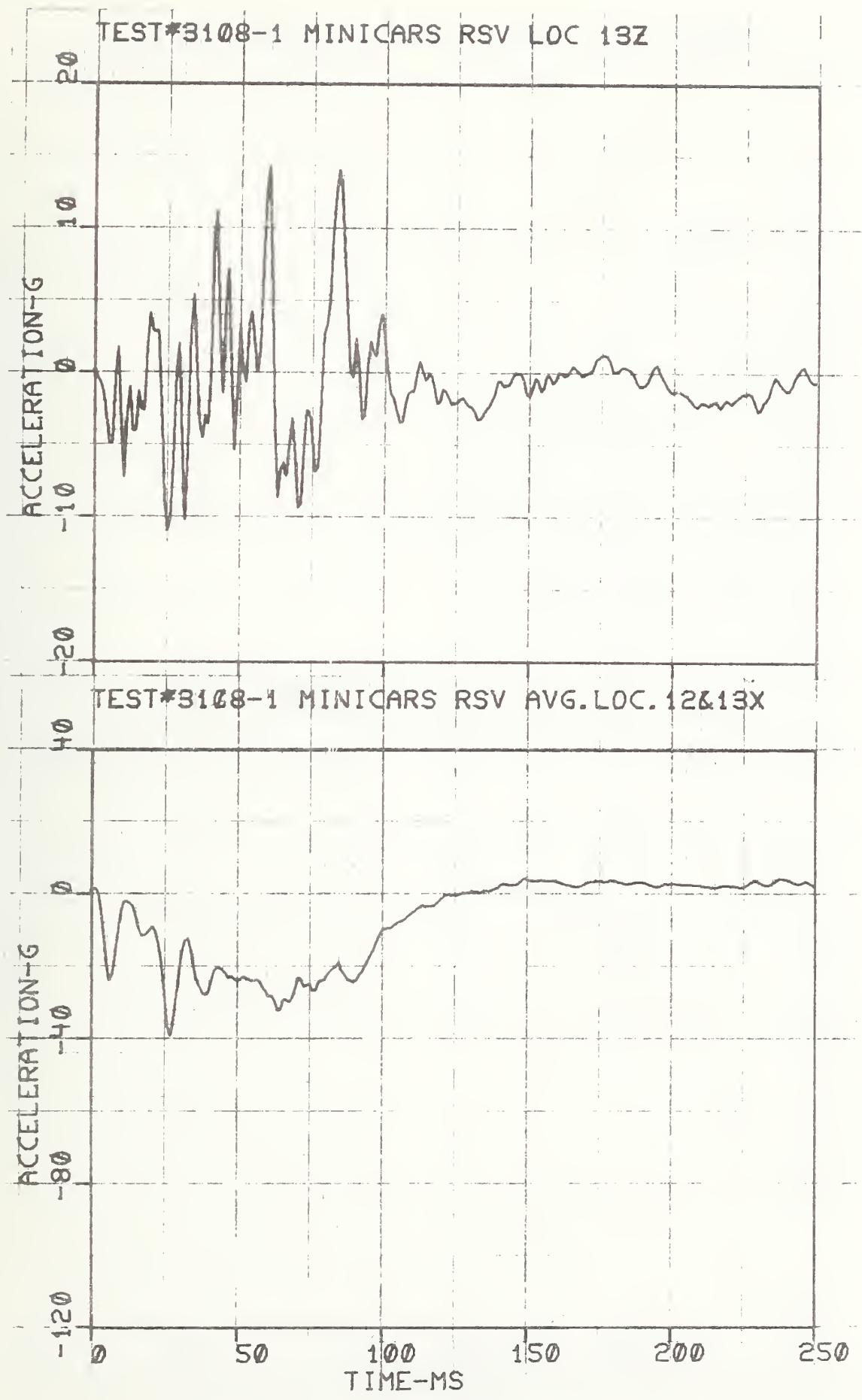


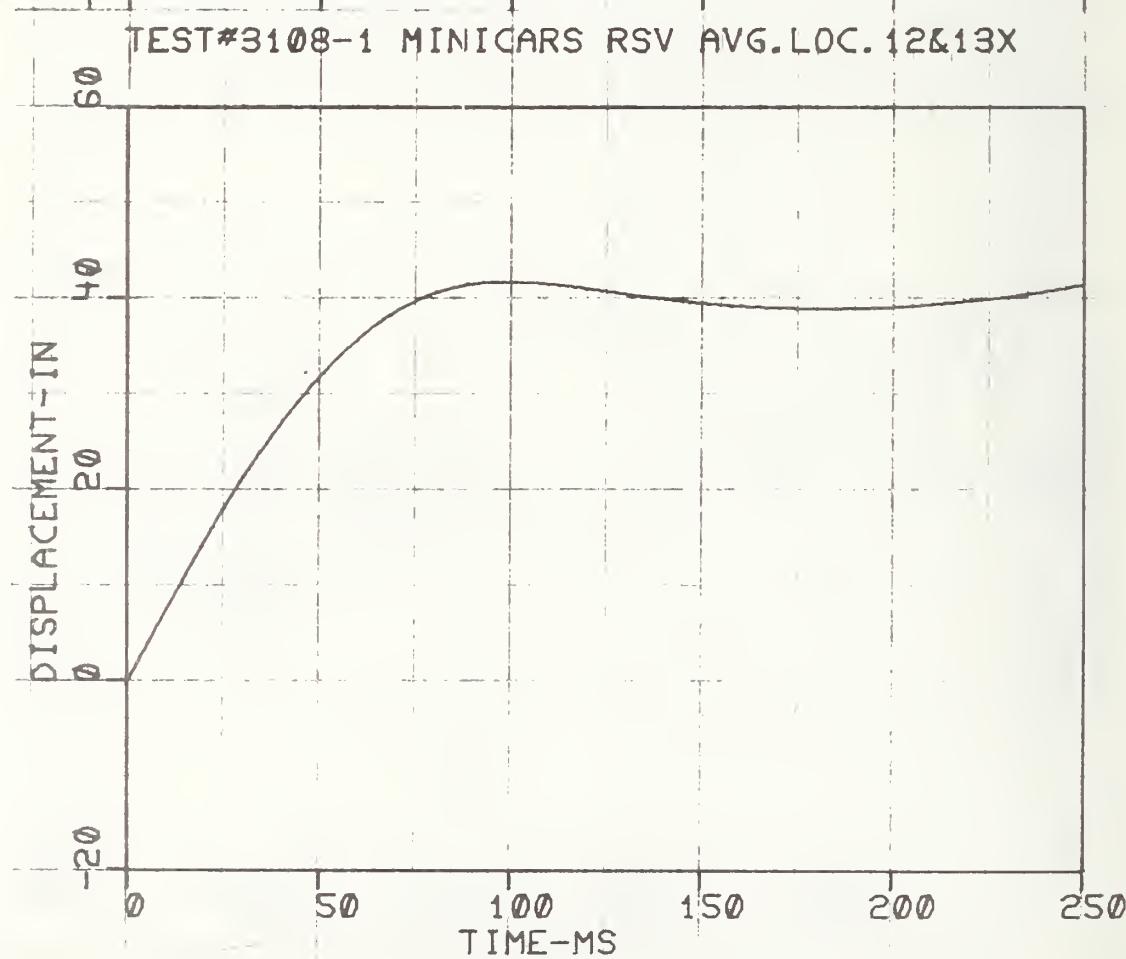
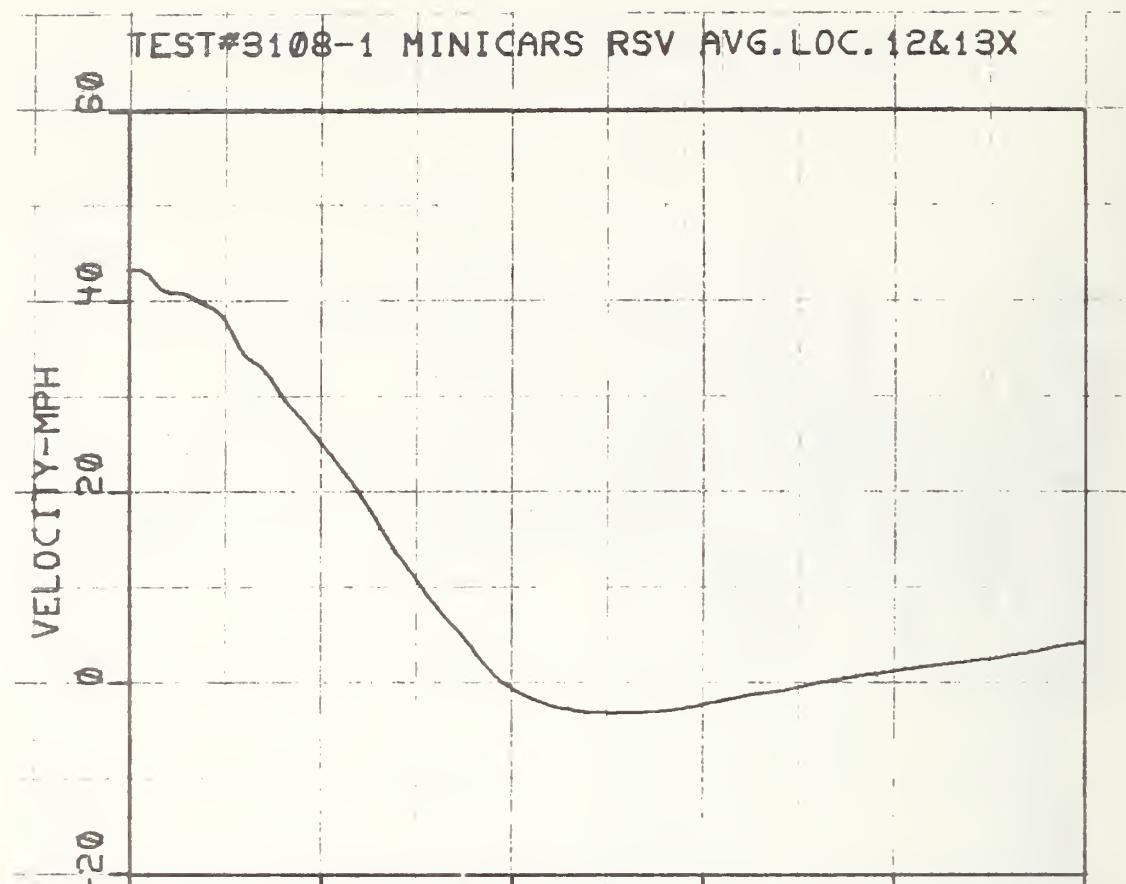
TEST#3108-1 MINICARS RSV LOC 13RX



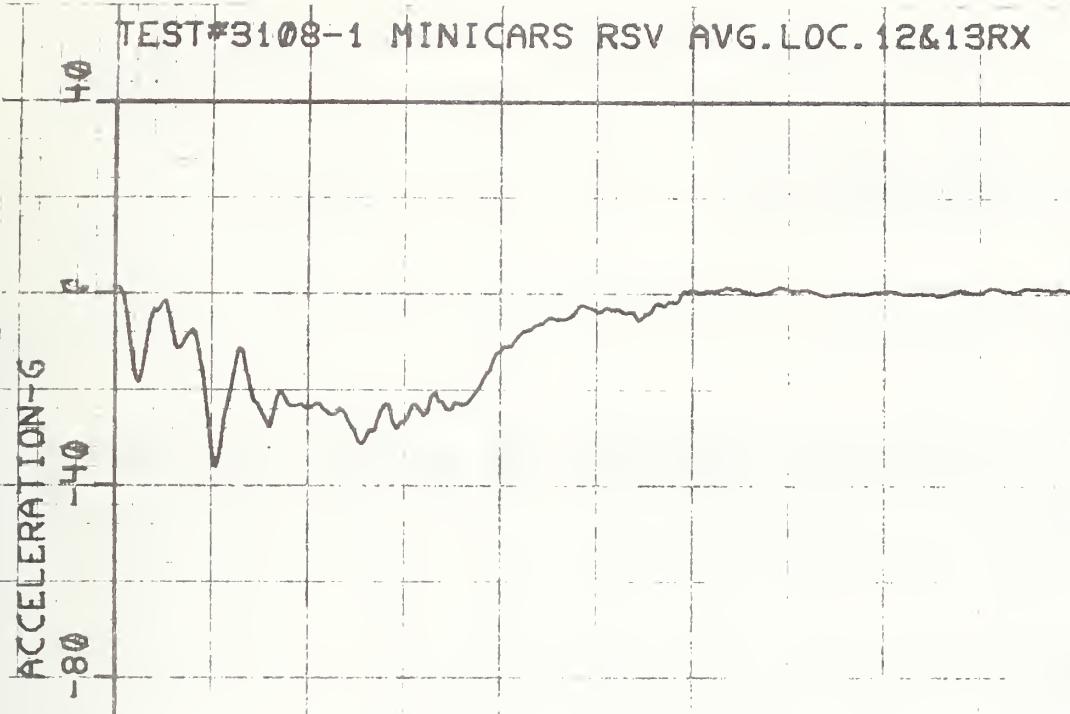
TEST#3108-1 MINICARS RSV LOC 13Y



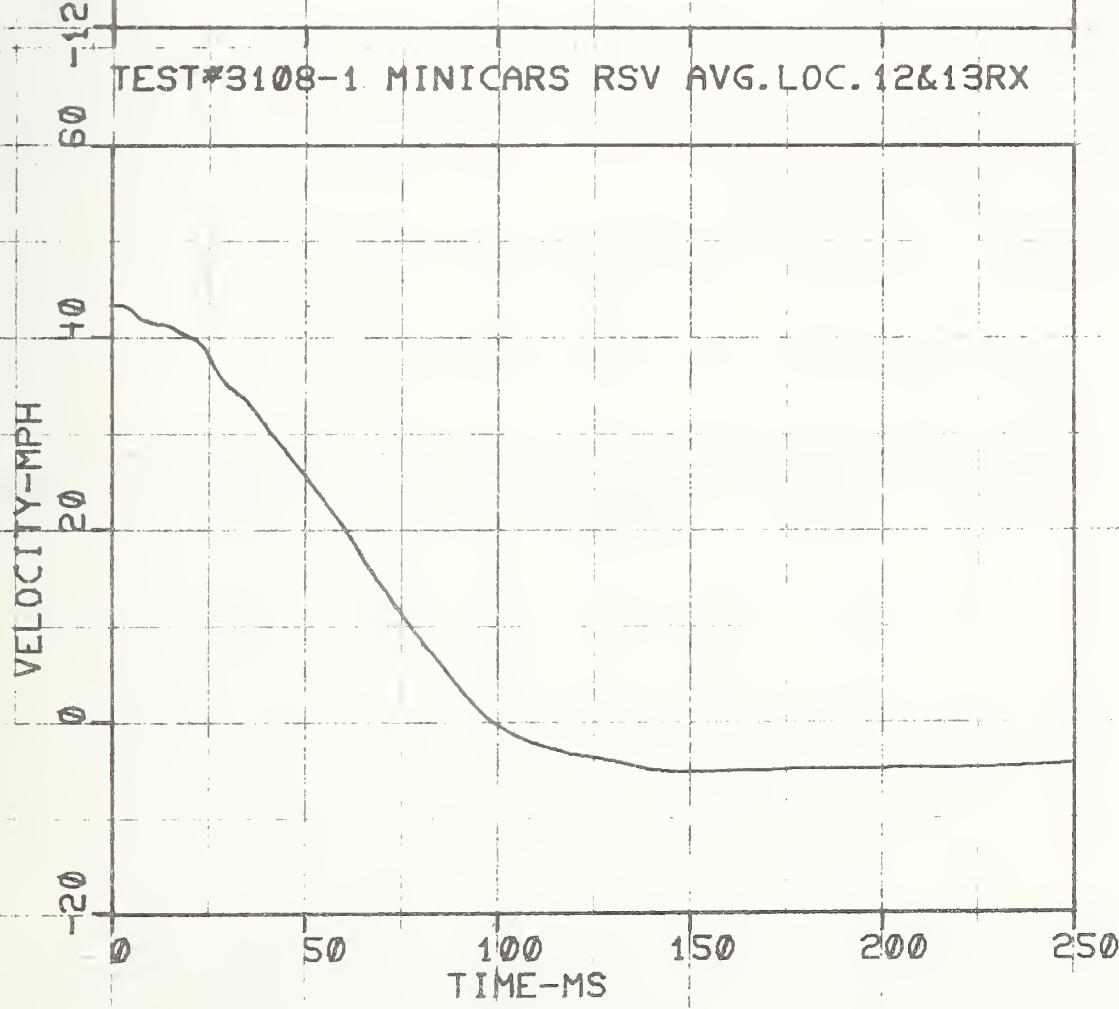


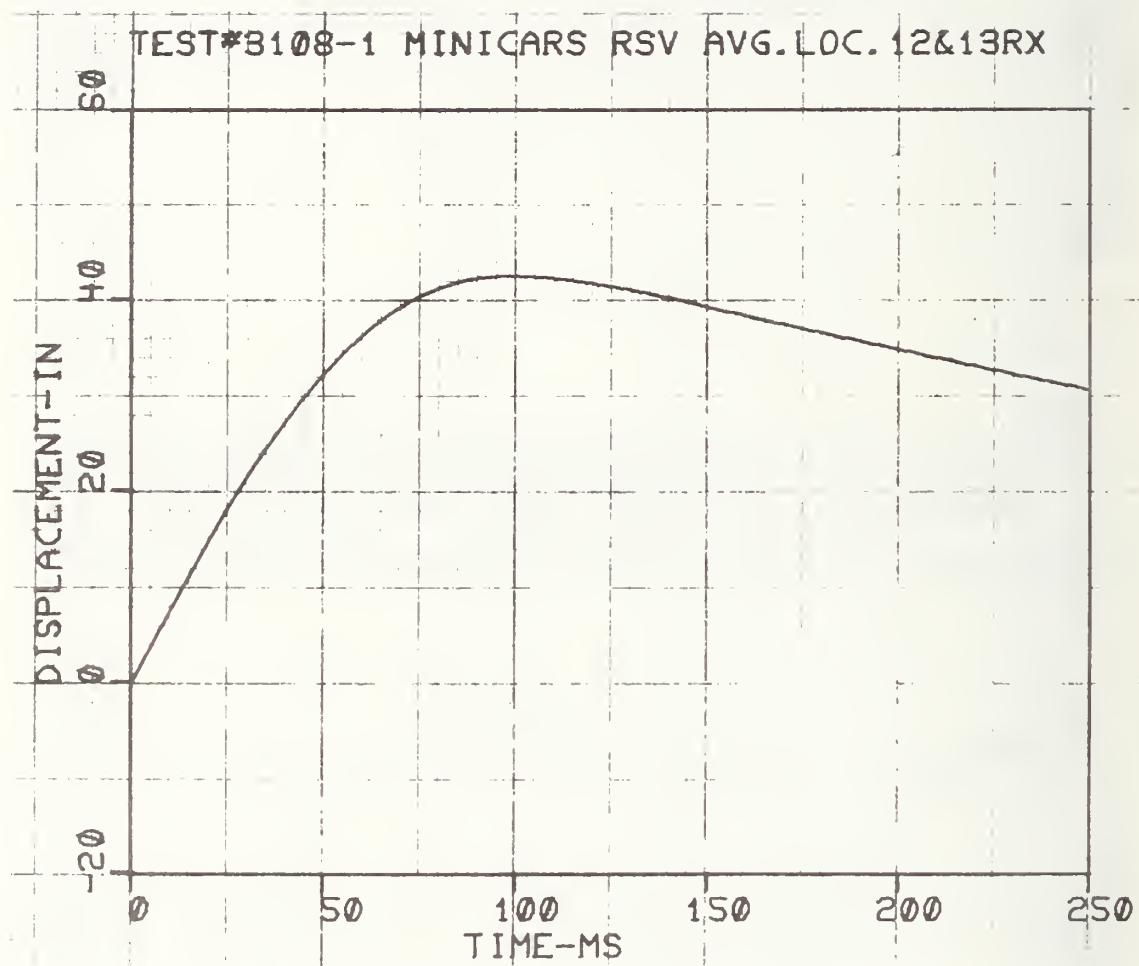


TEST#3108-1 MINICARS RSV AVG.LOC. 12&13RX



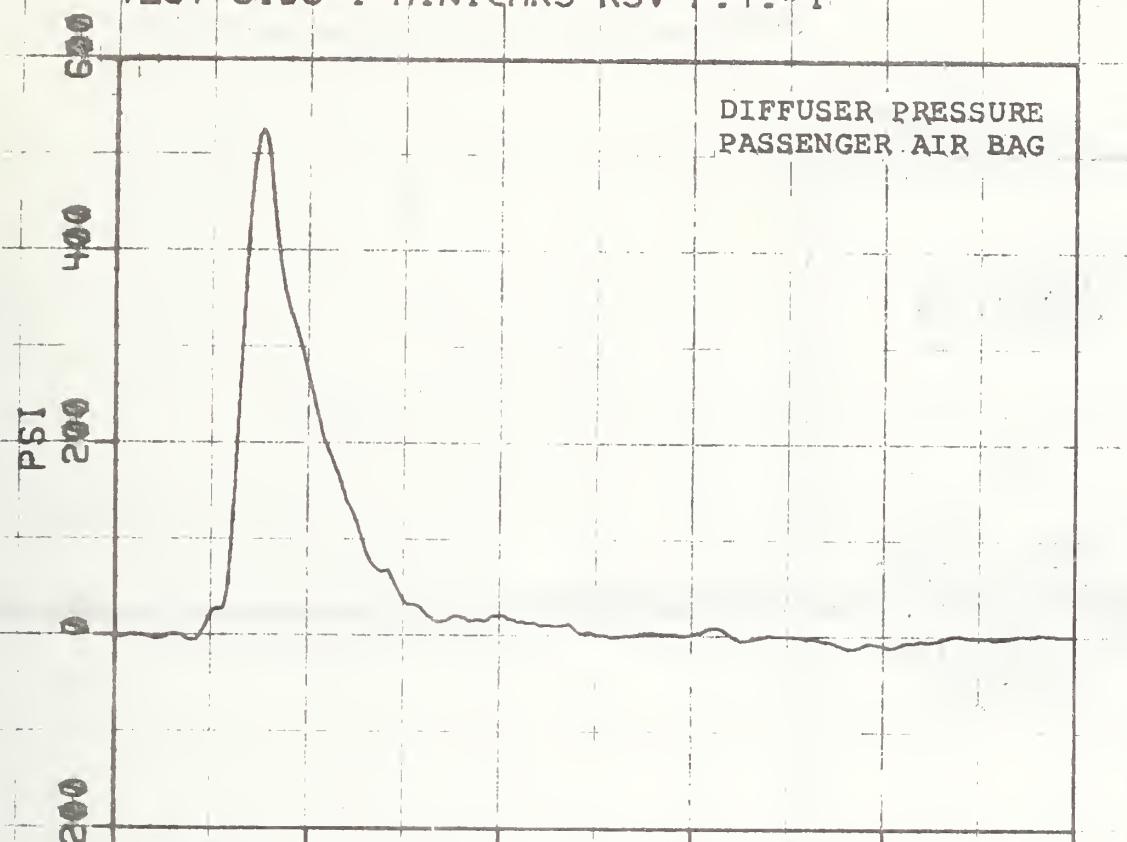
TEST#3108-1 MINICARS RSV AVG.LOC. 12&13RX





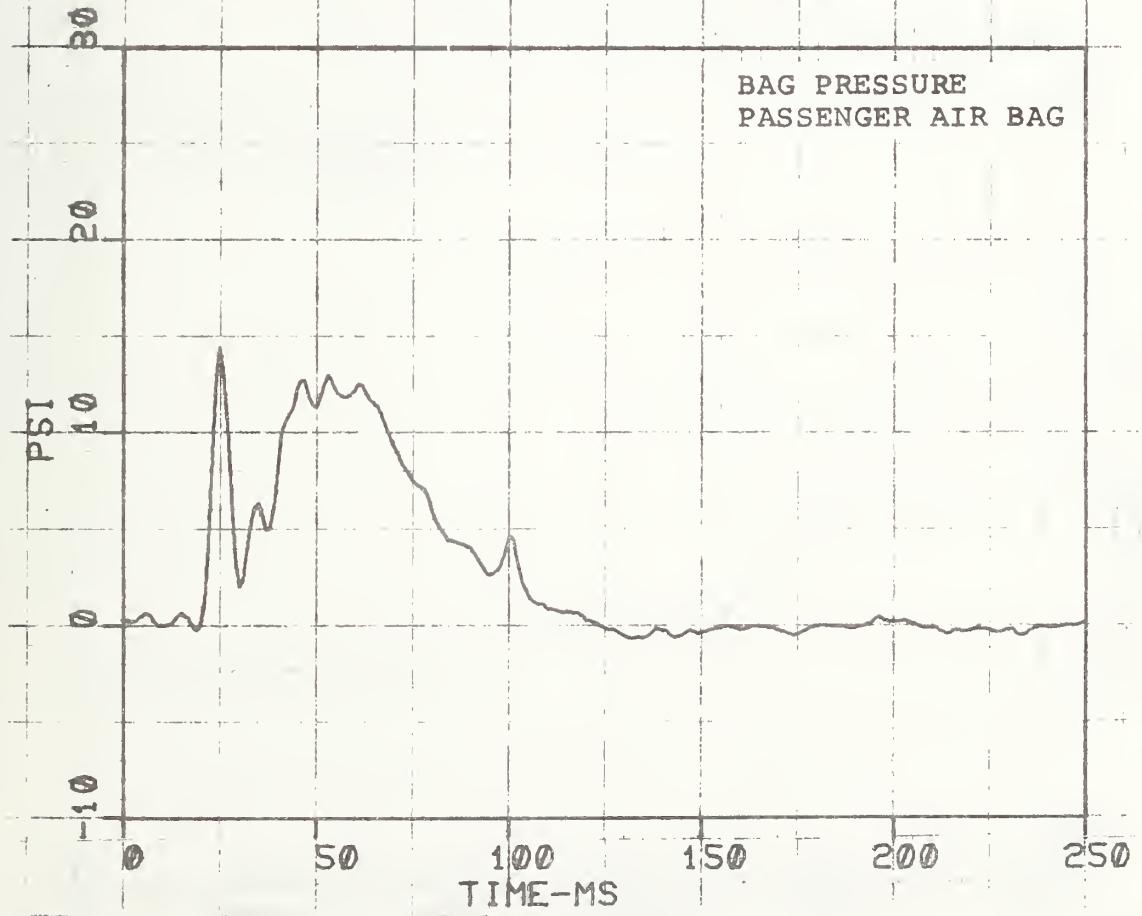
TEST#3108-1 MINICARS RSV P.T.#1

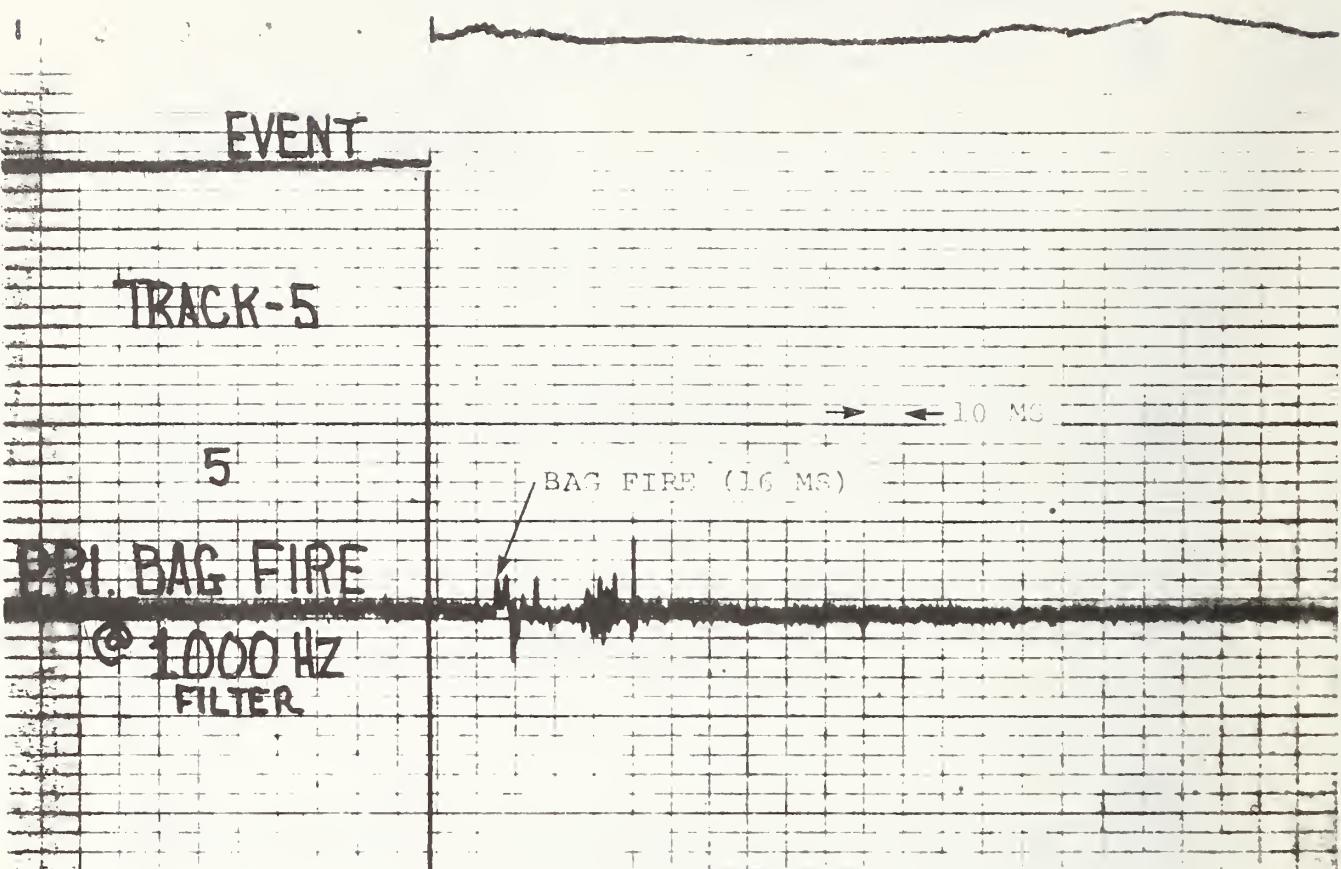
DIFFUSER PRESSURE
PASSENGER AIR BAG



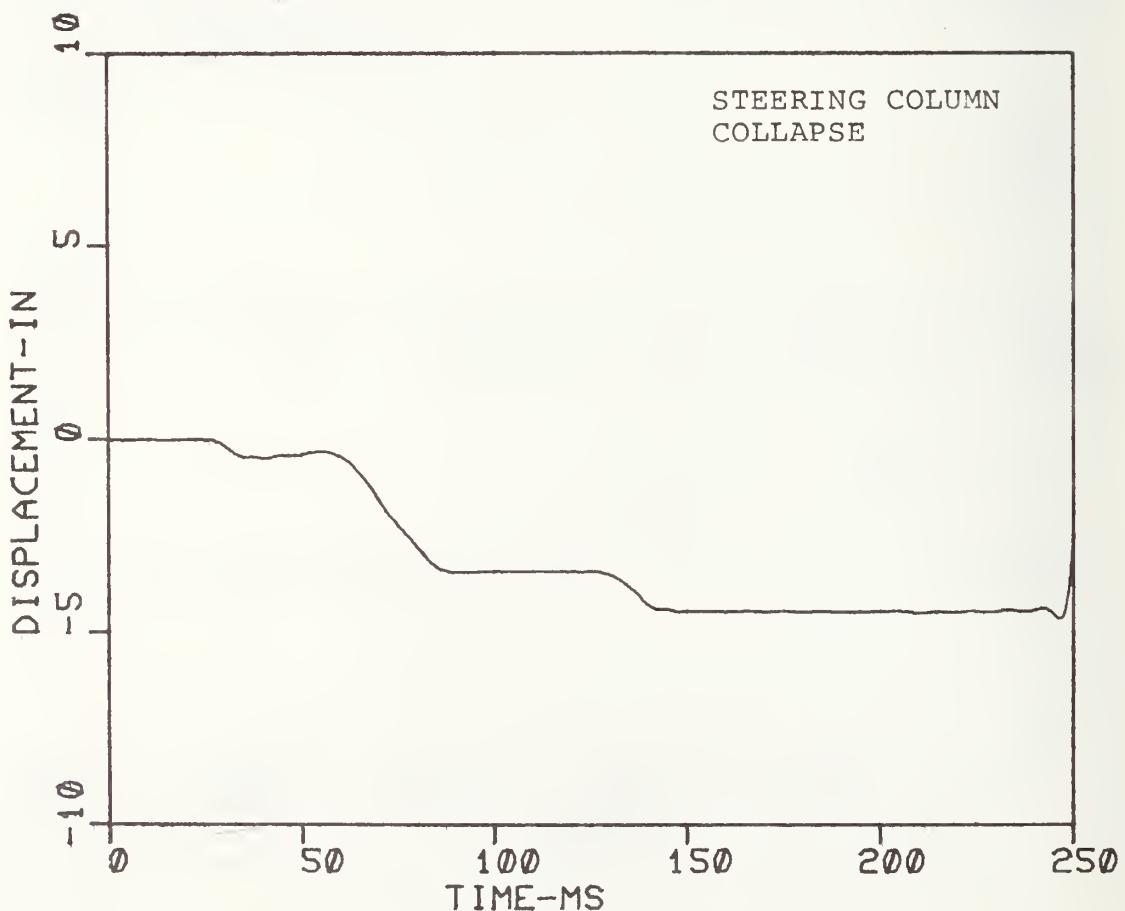
TEST#3108-1 MINICARS RSV P.T.#2

BAG PRESSURE
PASSENGER AIR BAG





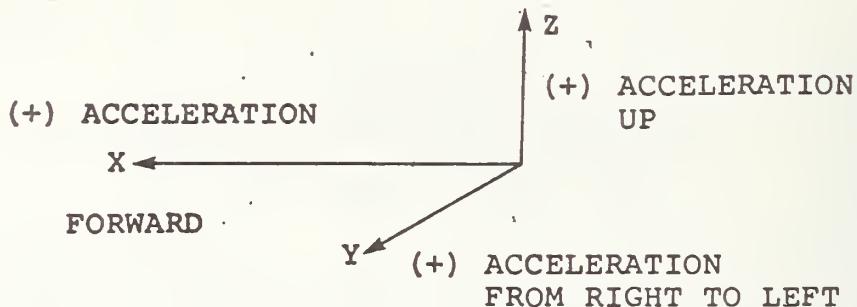
TEST#3108-1 MINICARS RSV S.P.#1



APPENDIX B
1979 DODGE CHALLENGER OCCUPANT
AND VEHICLE DATA PLOTS

The sign convention used on this test is presented below:

(1) Vehicle and dummy accelerations



(Minicars Sign Convention)

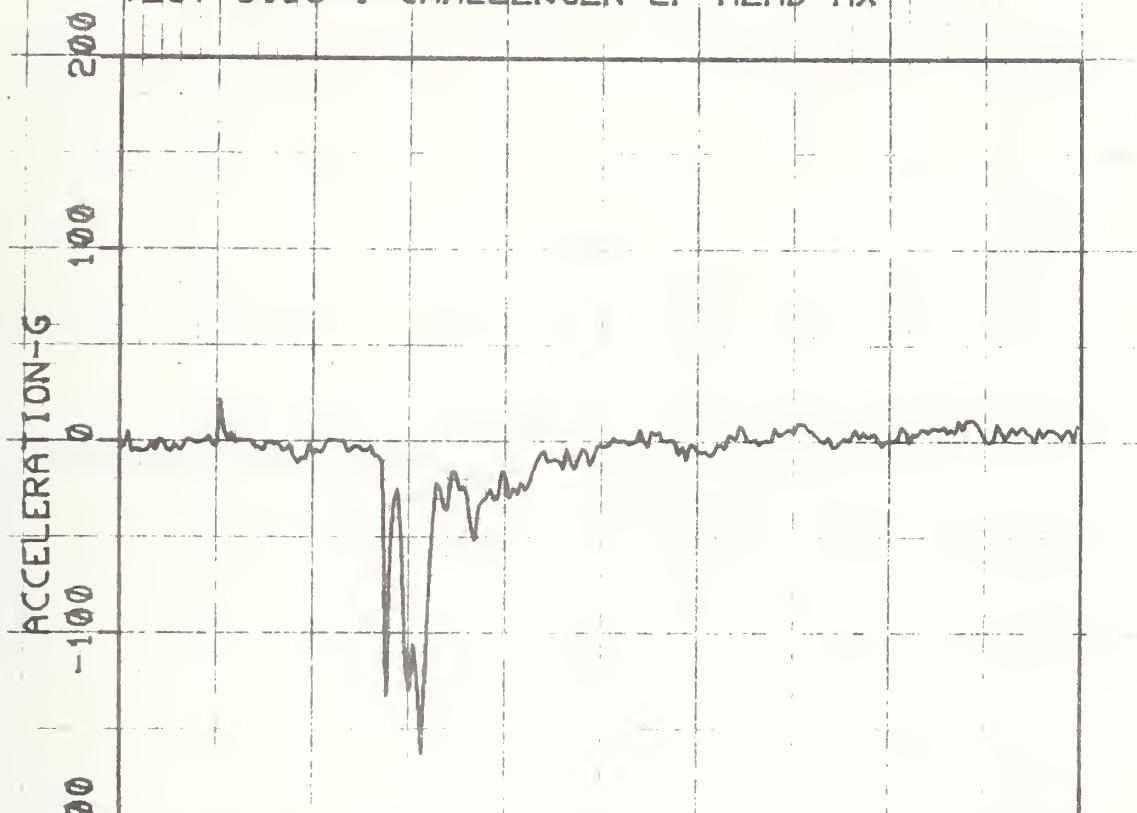
(2) Velocity and displacement agree with the above convention.

NOTE: All Y and Z channel data was reversed in polarity in order to conform with the above sign convention used by Minicars.

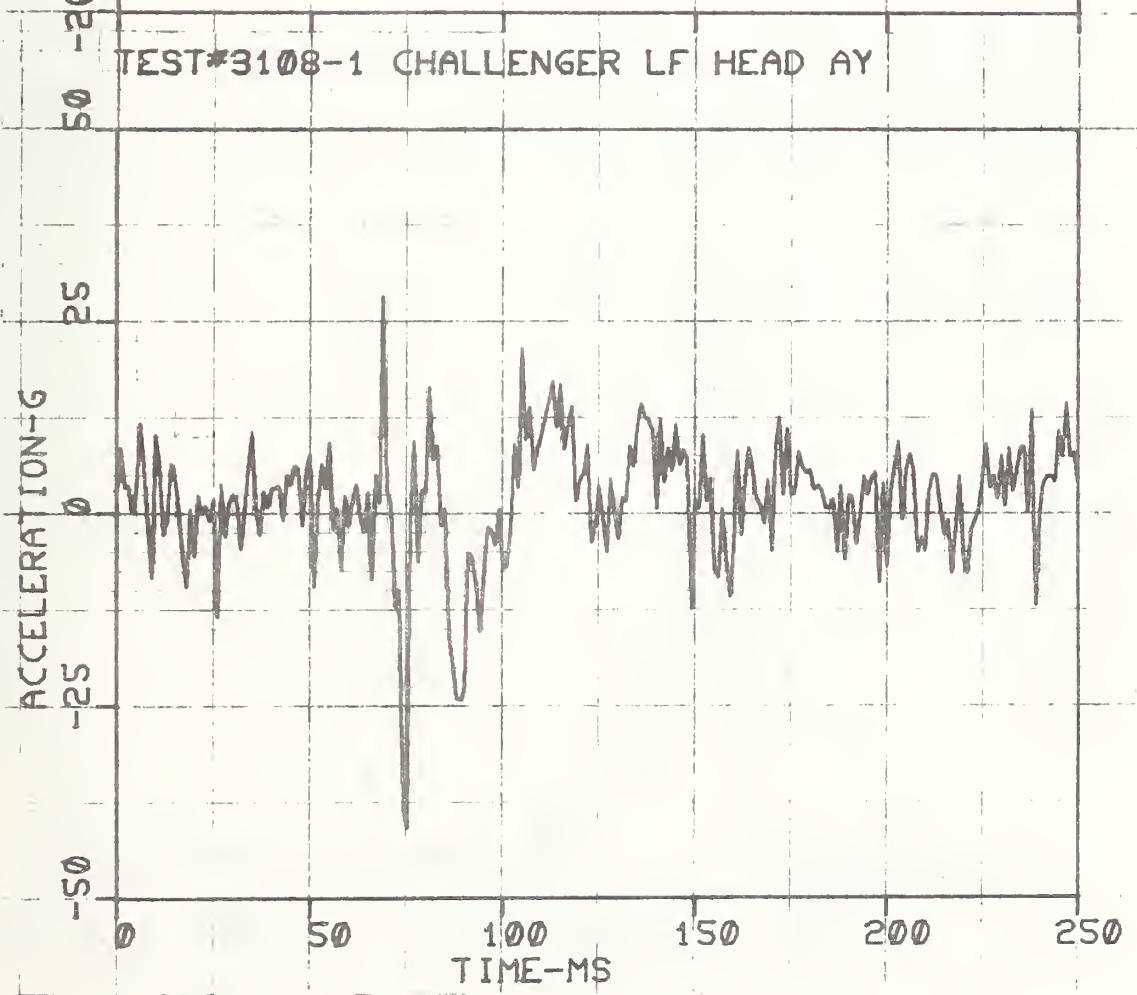
Data filtered per SAE recommended practice J211b as follows:

<u>Test Measurement</u>	<u>Channel Class</u>
Dummy Head	1000
Dummy Chest	180
Dummy Pelvis	180
Dummy Femurs	600
Vehicle Structure	60

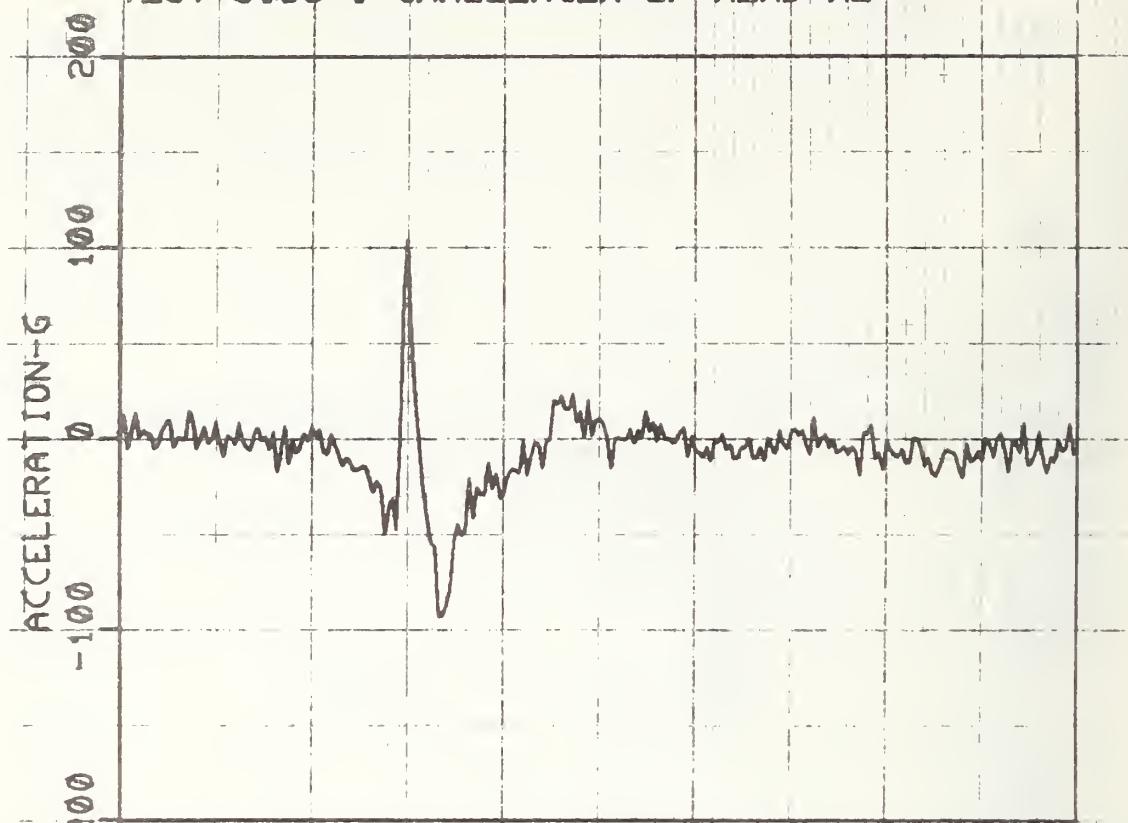
TEST#3108-1 CHALLENGER LF HEAD AX



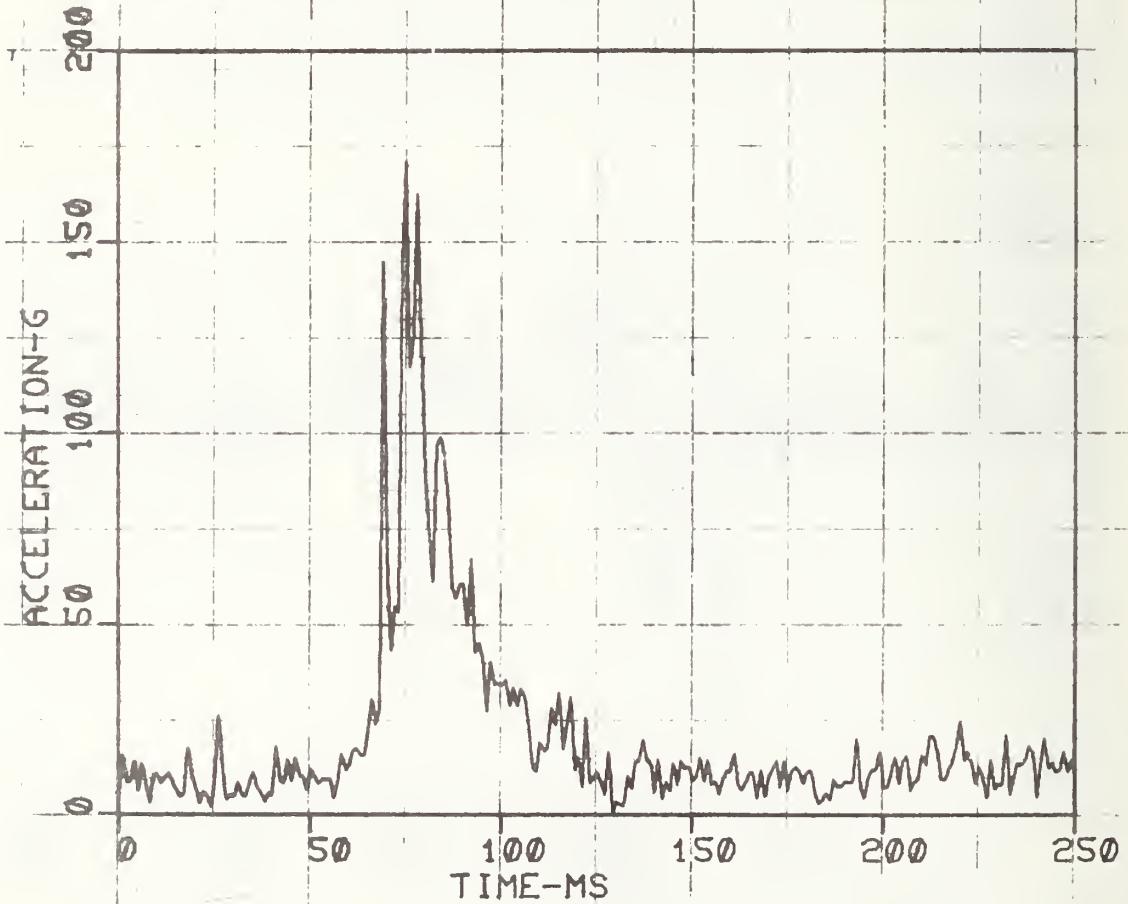
TEST#3108-1 CHALLENGER LF HEAD AY



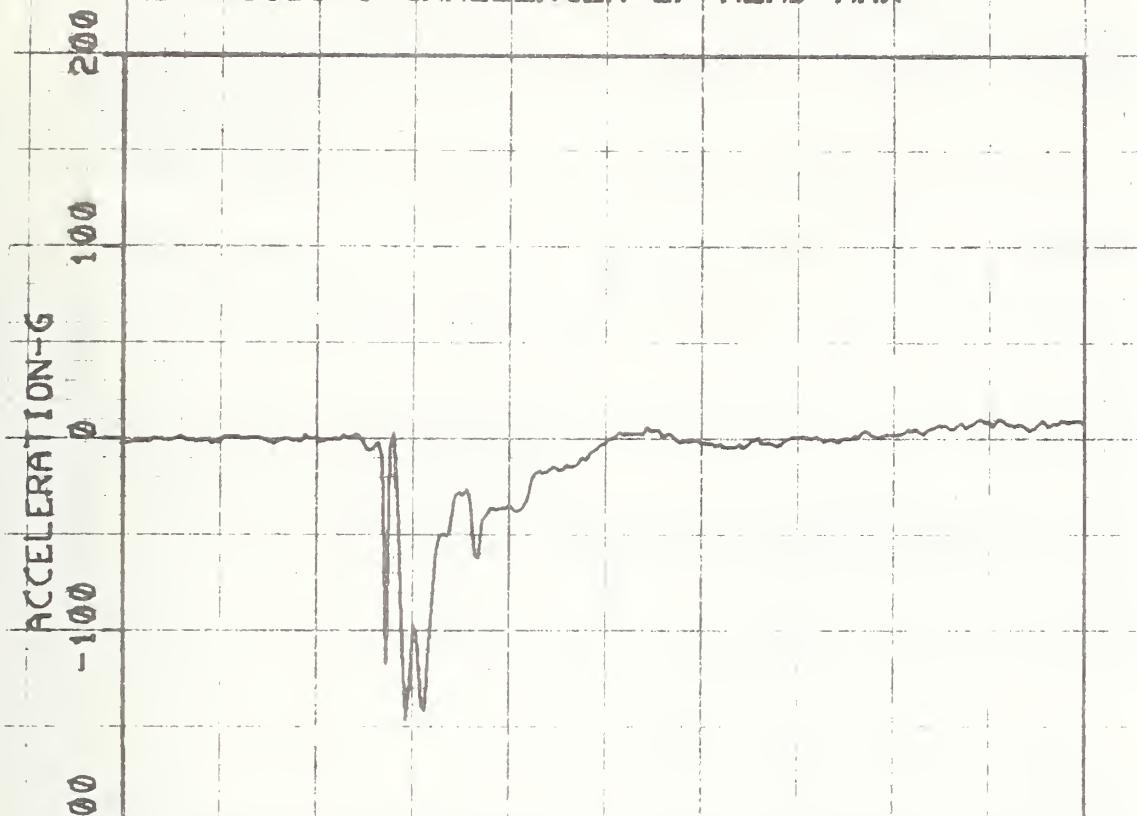
TEST#3108-1 CHALLENGER LF HEAD AZ



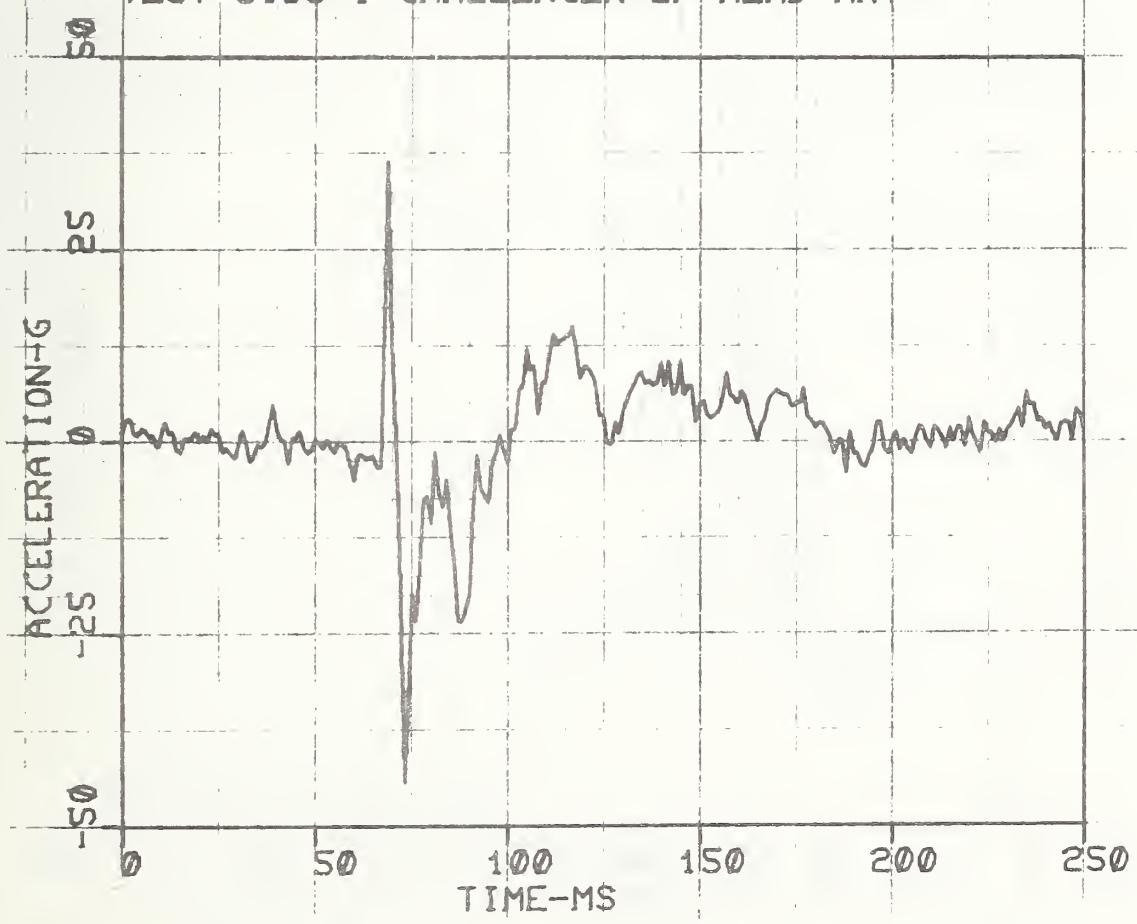
TEST#3108-1 CHALLENGER LF HEAD AR



TEST#3108-1 CHALLENGER LF HEAD ARX

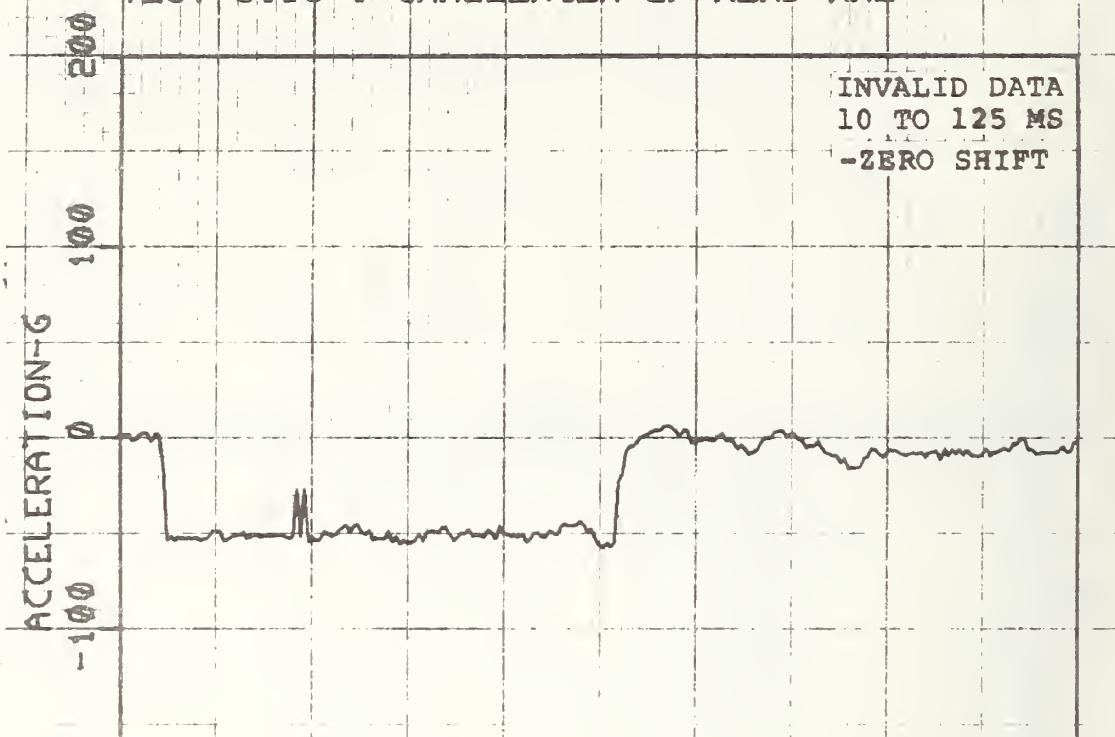


TEST#3108-1 CHALLENGER LF HEAD ARY



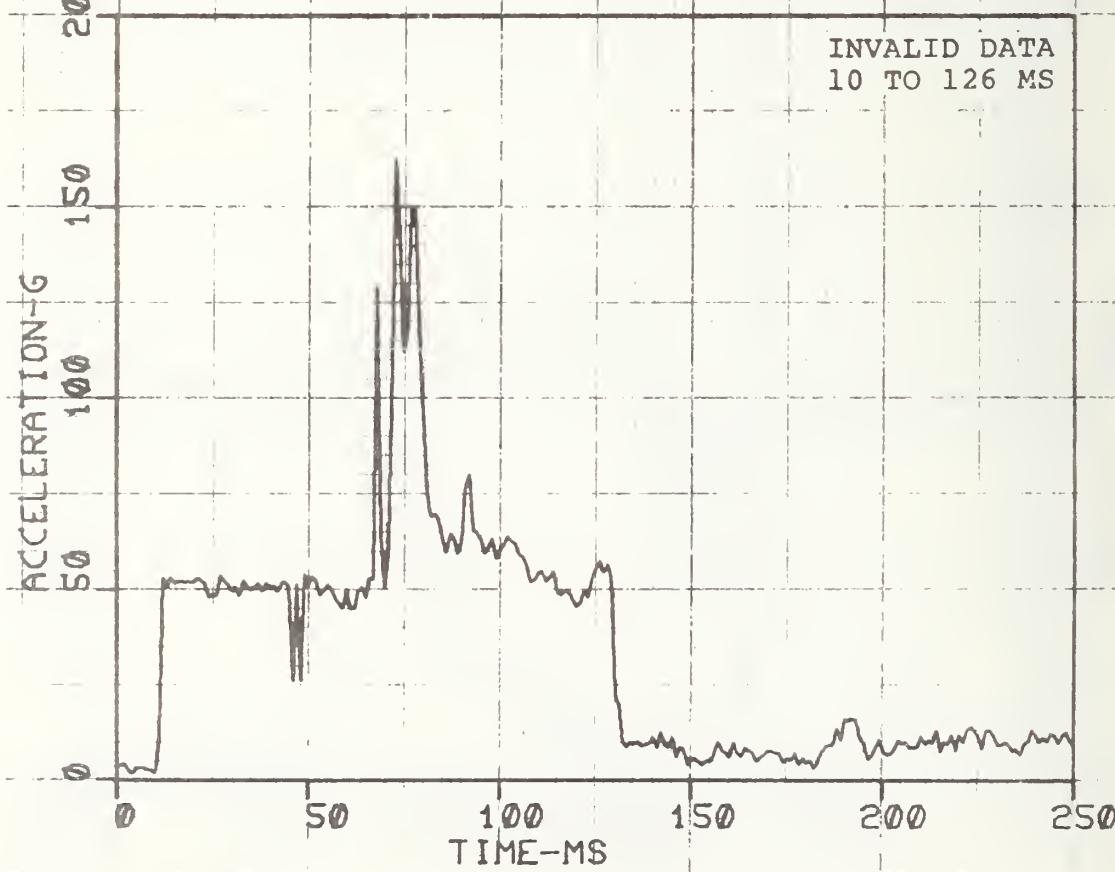
TEST#3108-1 CHALLENGER LF HEAD ARZ

INVALID DATA
10 TO 125 MS
-ZERO SHIFT

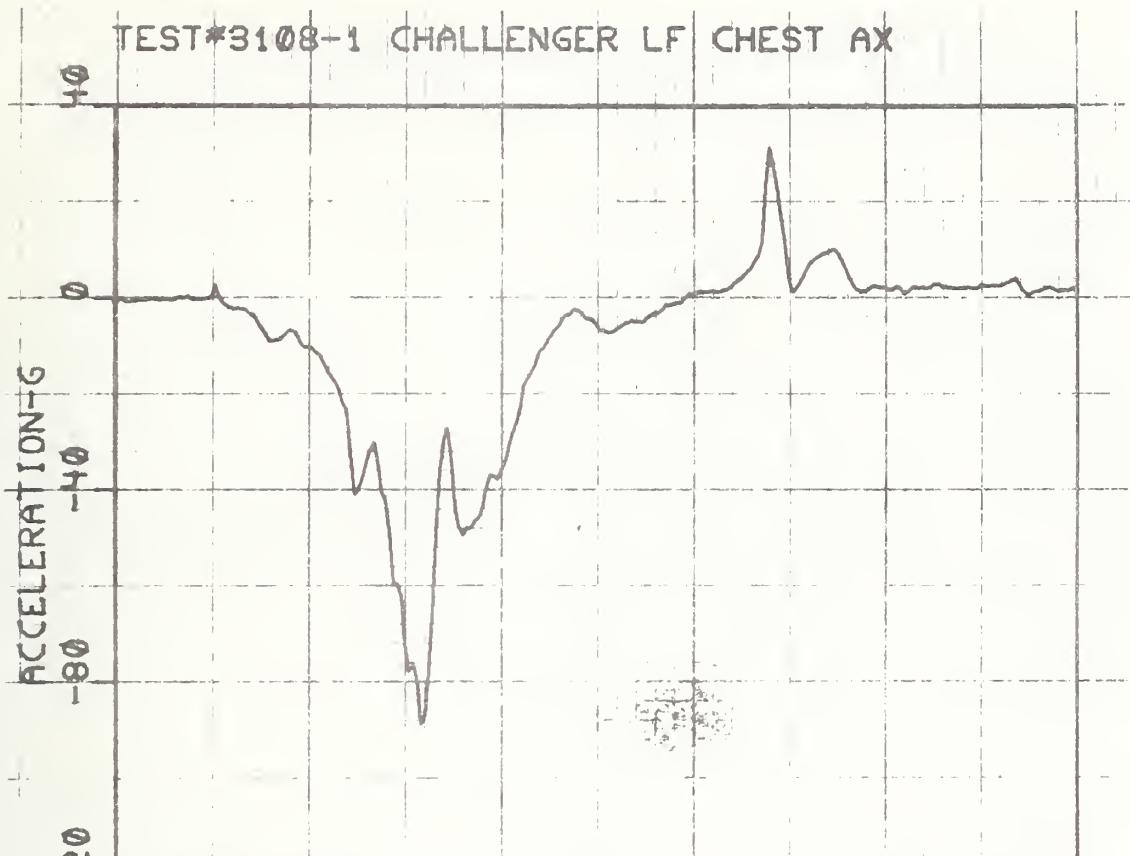


TEST#3108-1 CHALLENGER LF HEAD ARR

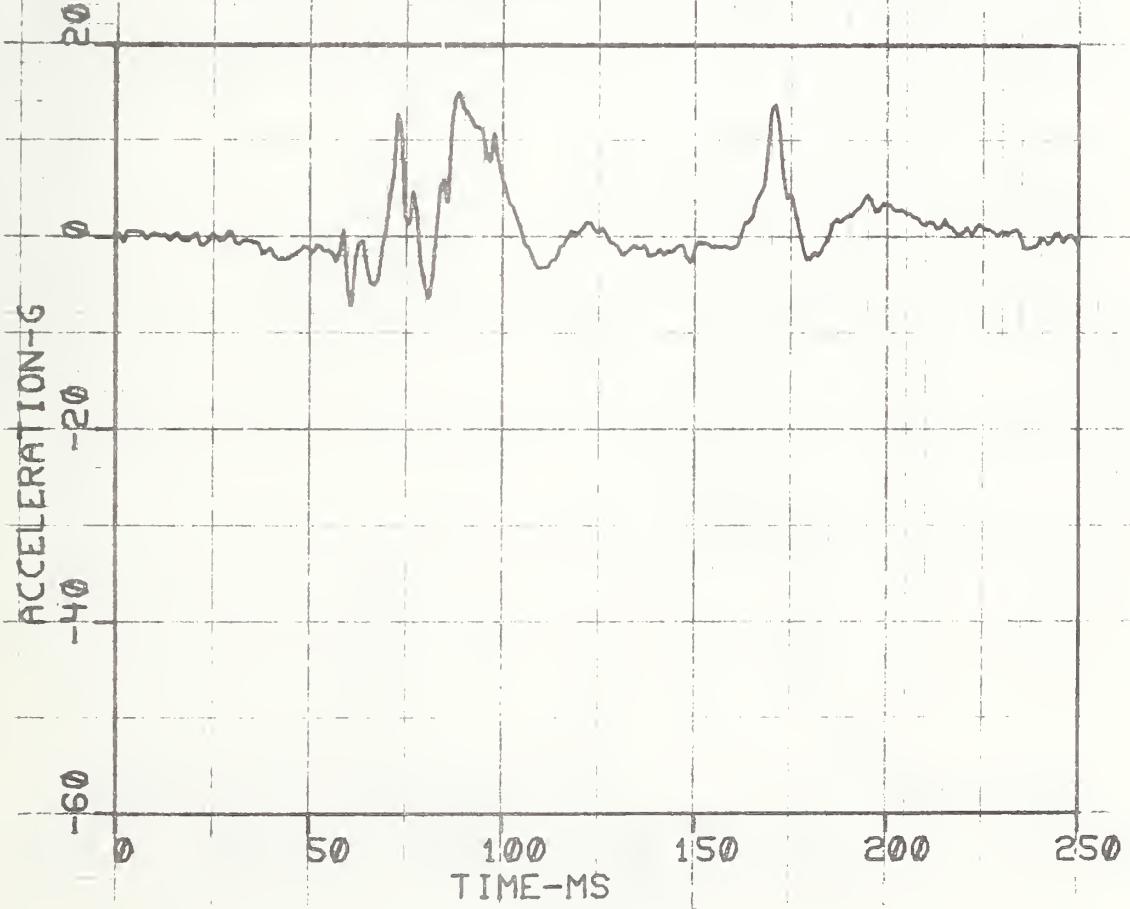
INVALID DATA
10 TO 126 MS



TEST#3108-1 CHALLENGER LF CHEST AX



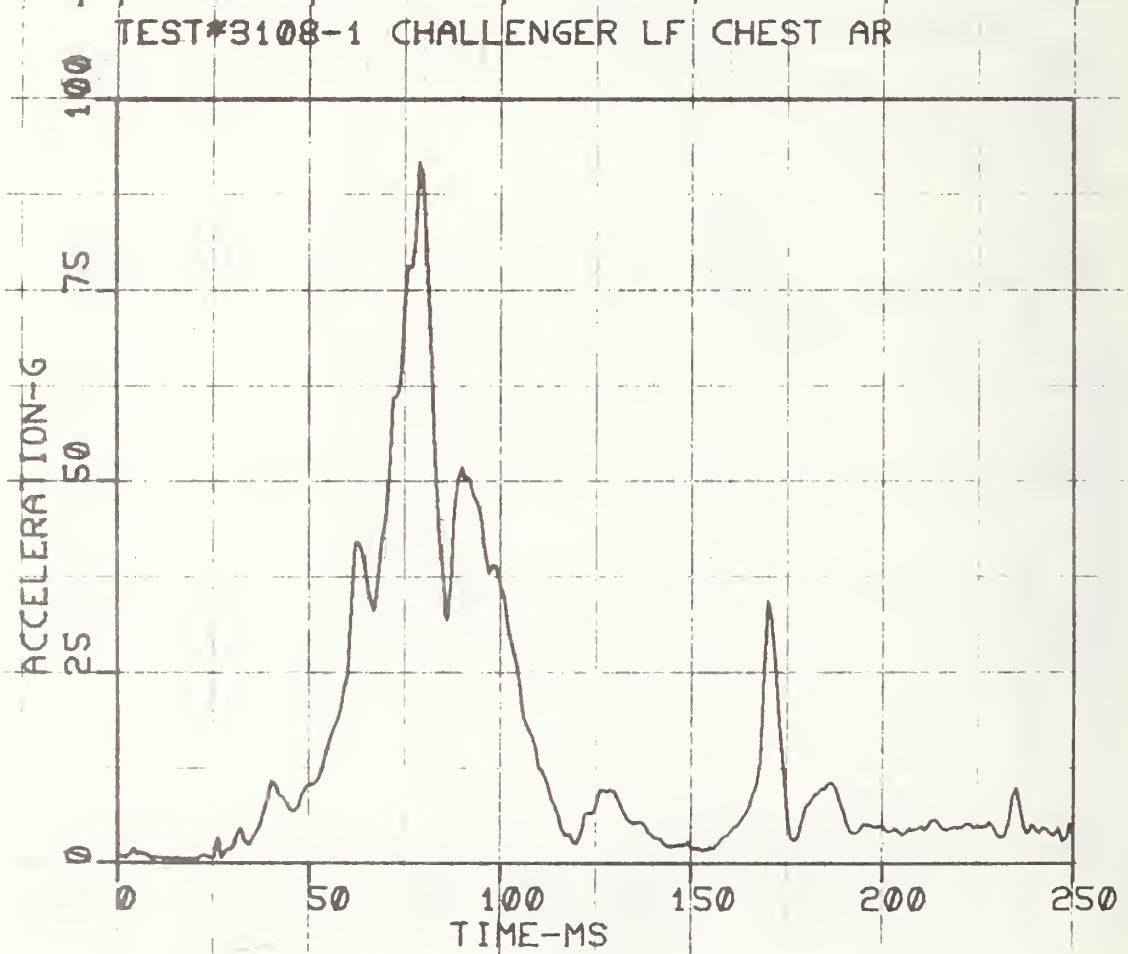
TEST#3108-1 CHALLENGER LF CHEST AY



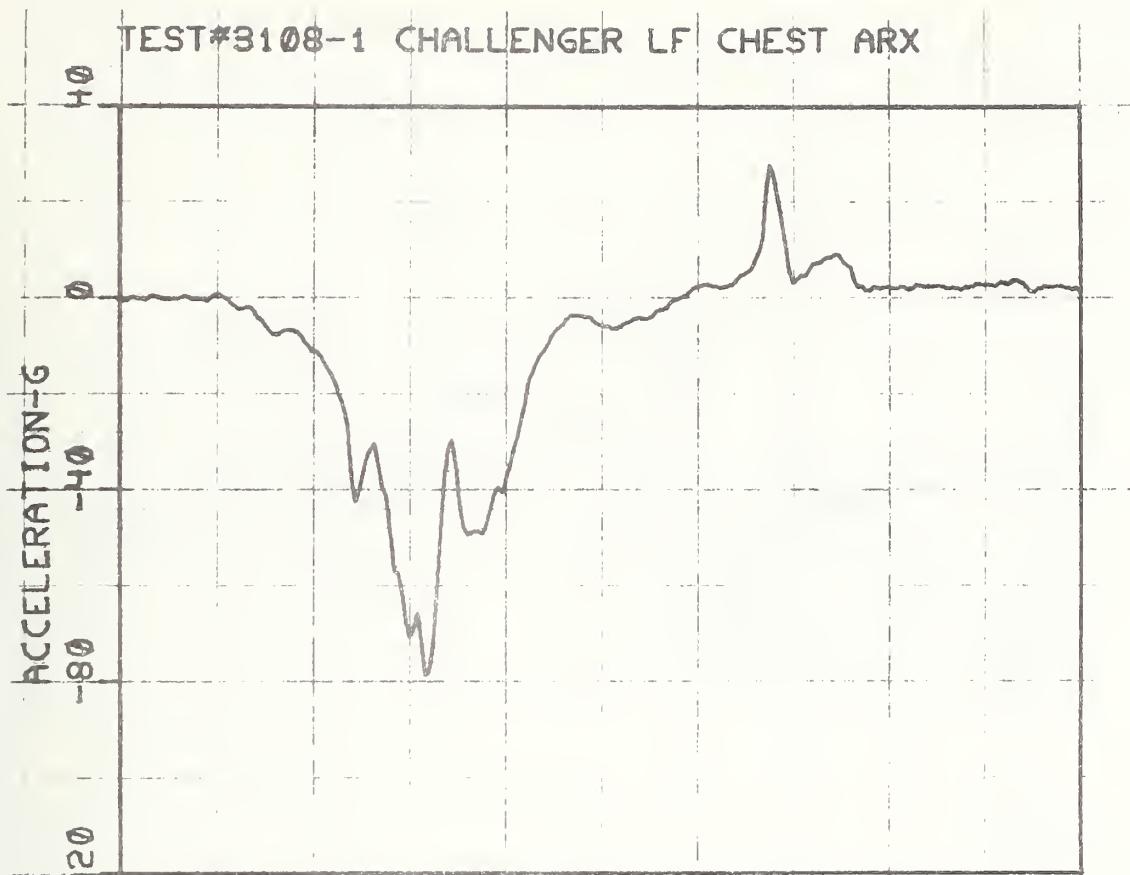
TEST#3108-1 CHALLENGER LF CHEST AZ



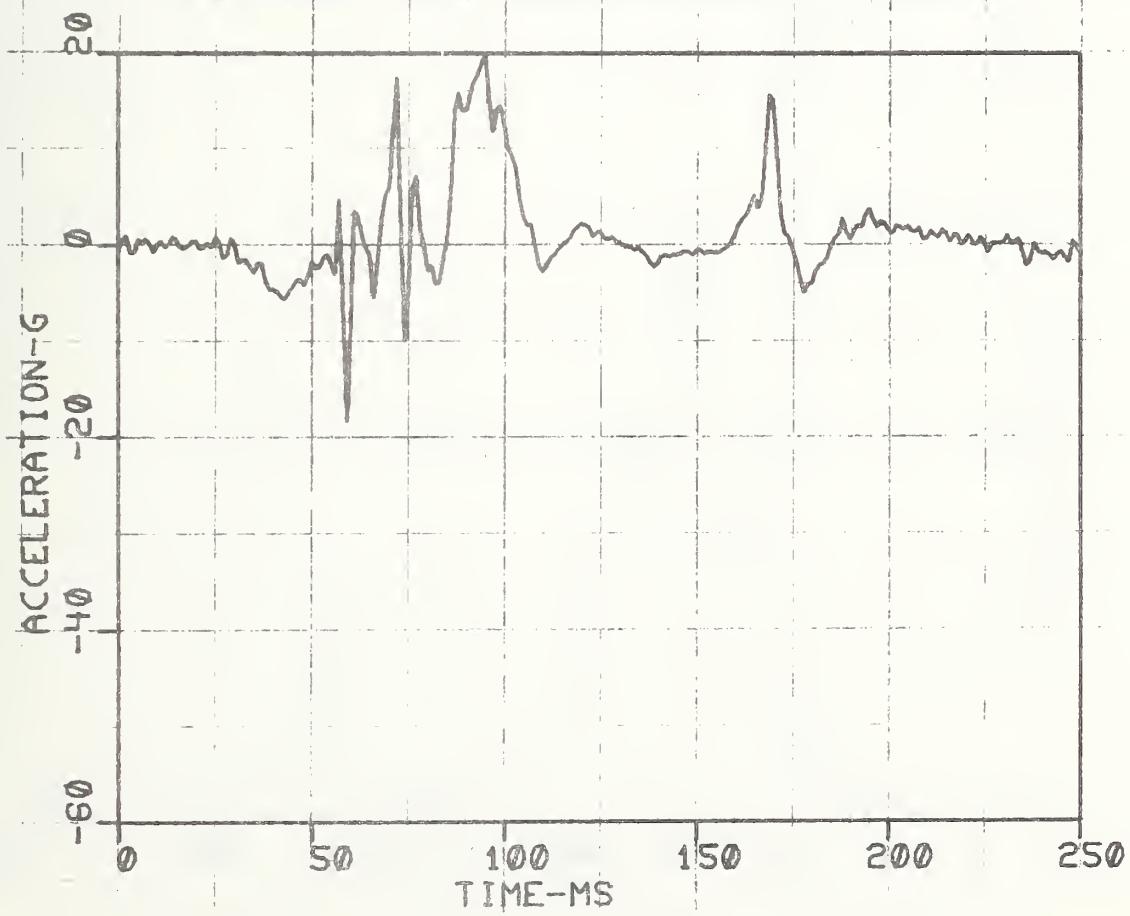
TEST#3108-1 CHALLENGER LF CHEST AR



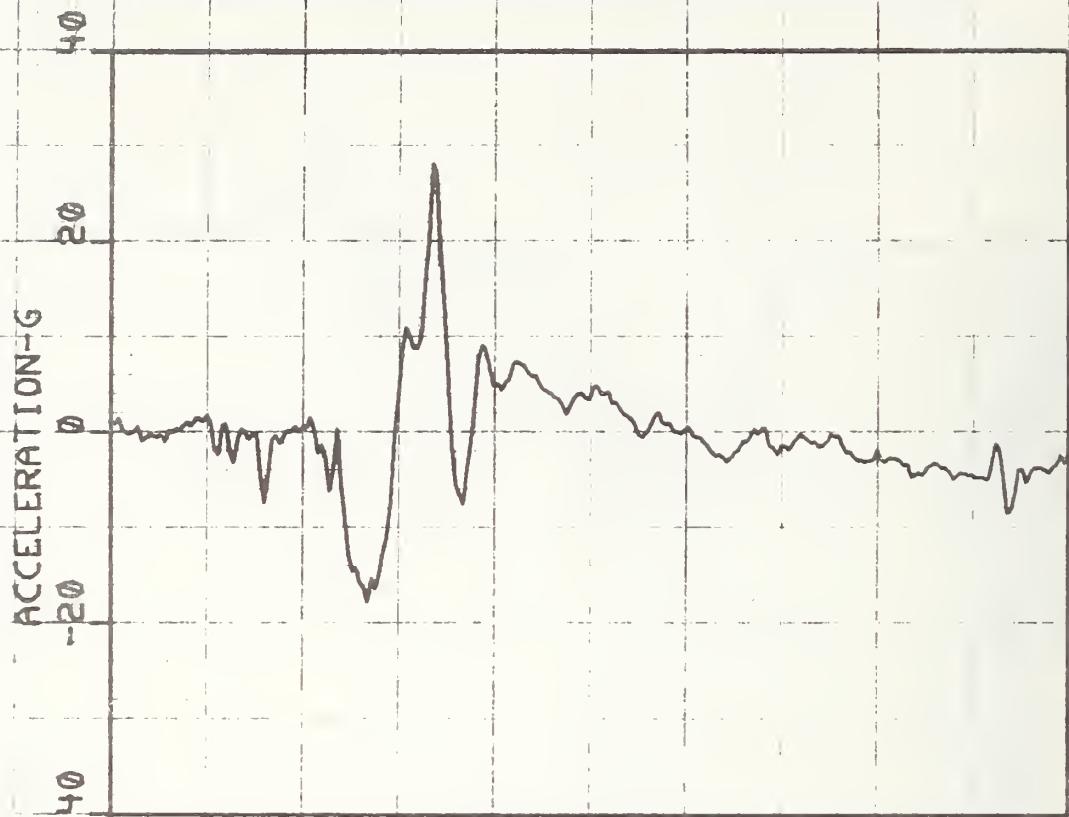
TEST#3108-1 CHALLENGER LF CHEST ARX



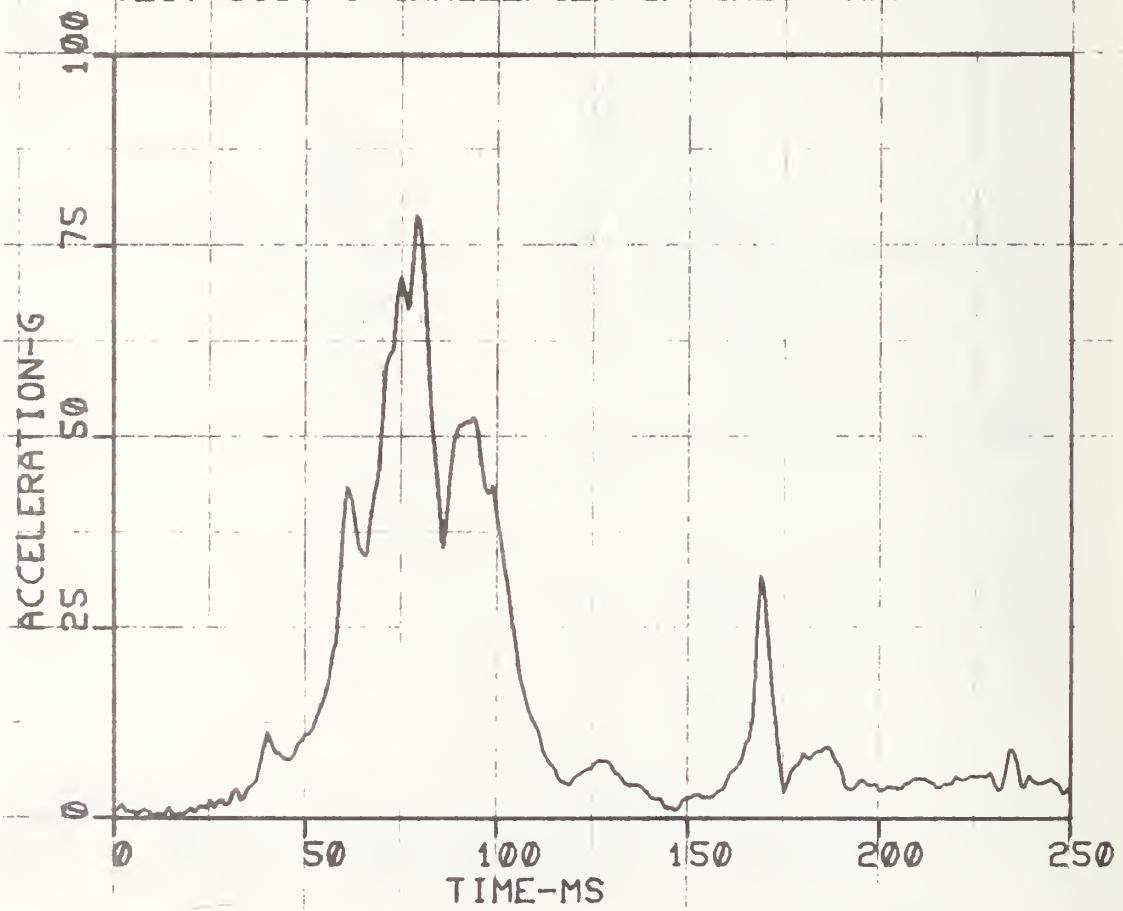
TEST#3108-1 CHALLENGER LF CHEST ARY



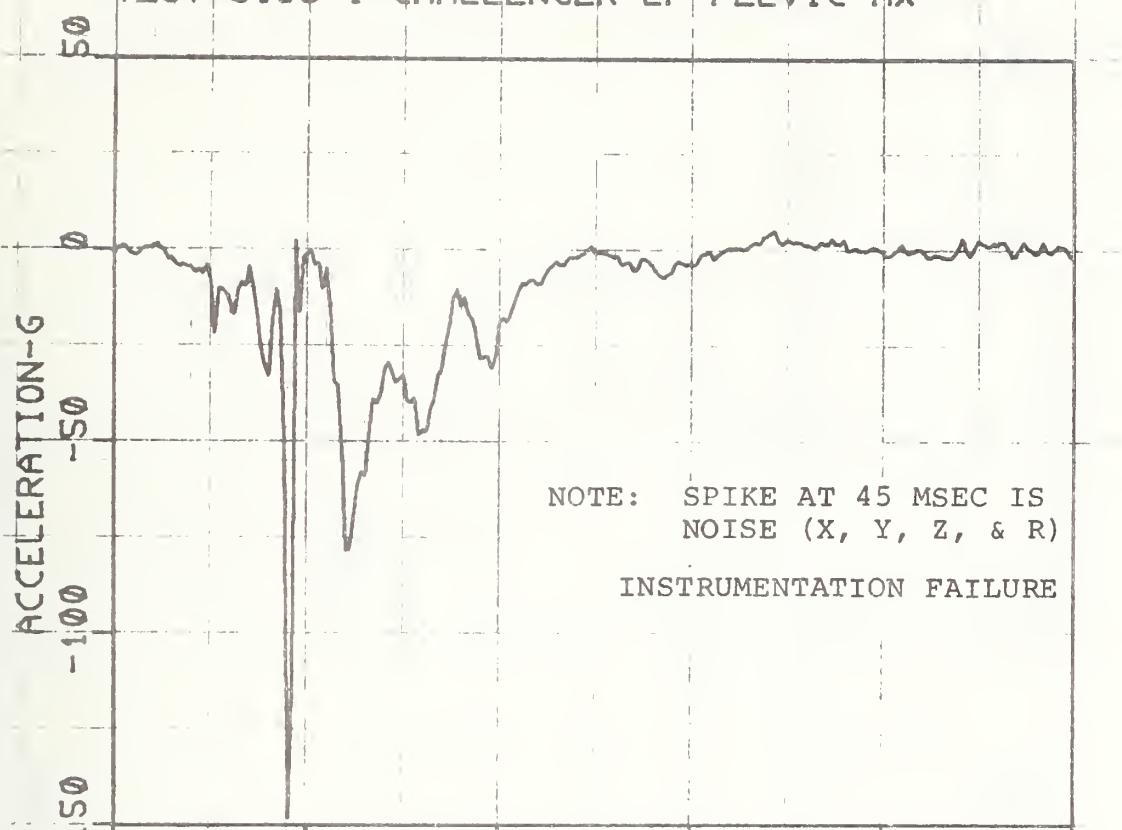
TEST#3108-1 CHALLENGER LF CHEST ARZ



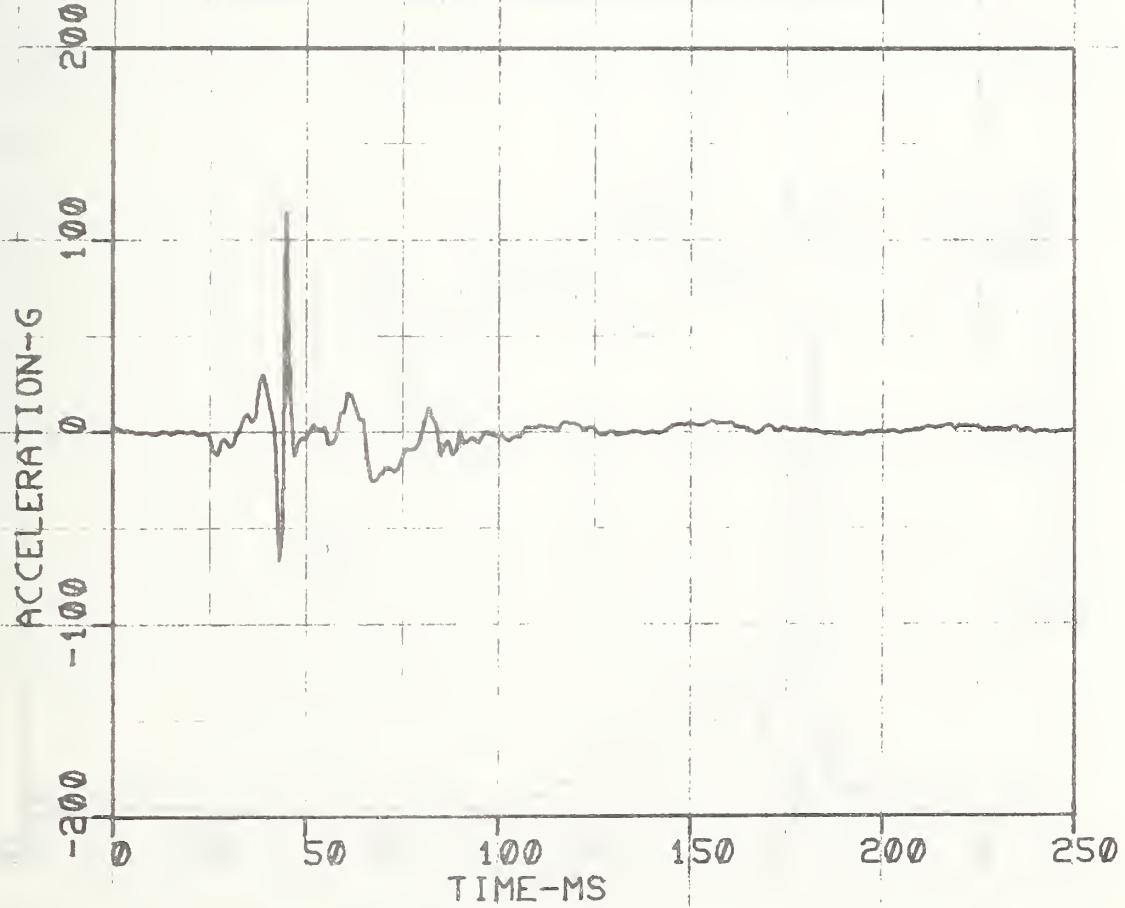
TEST#3108-1 CHALLENGER LF CHEST ARR



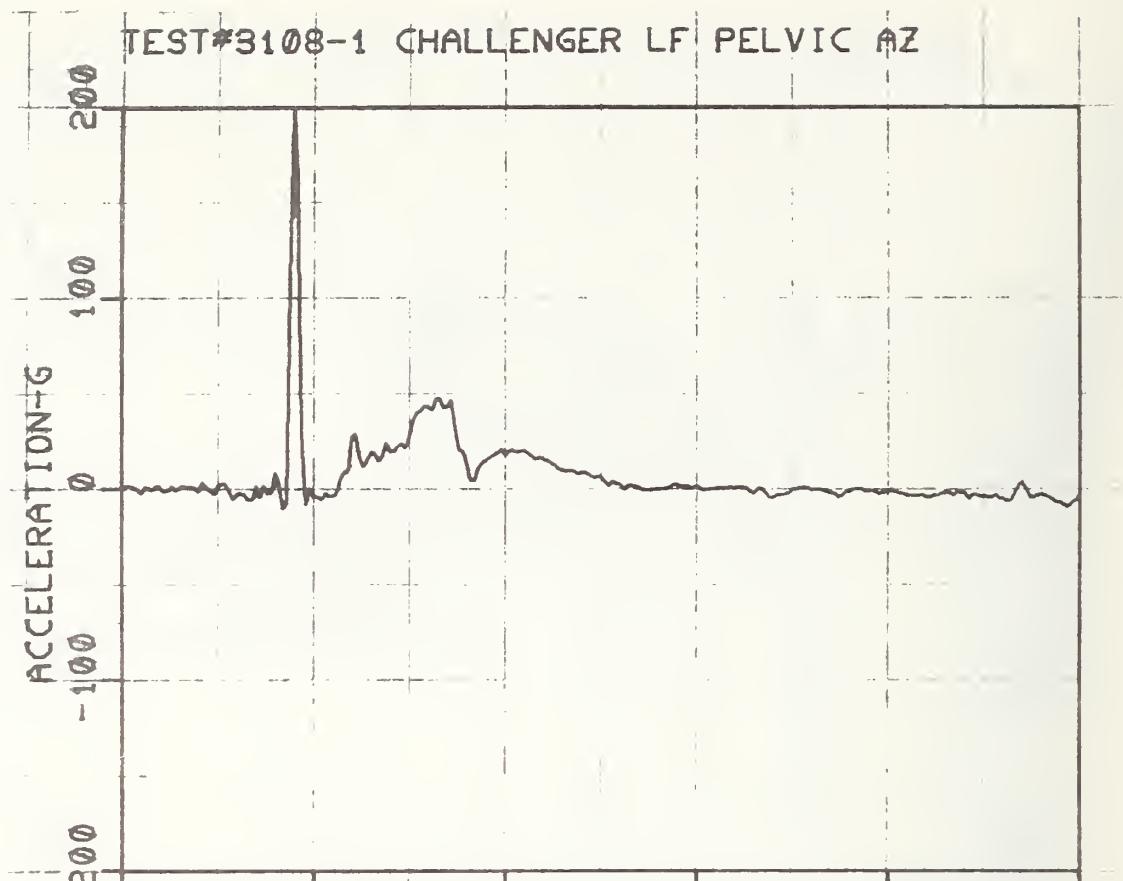
TEST#3108-1 CHALLENGER LF PELVIC AX



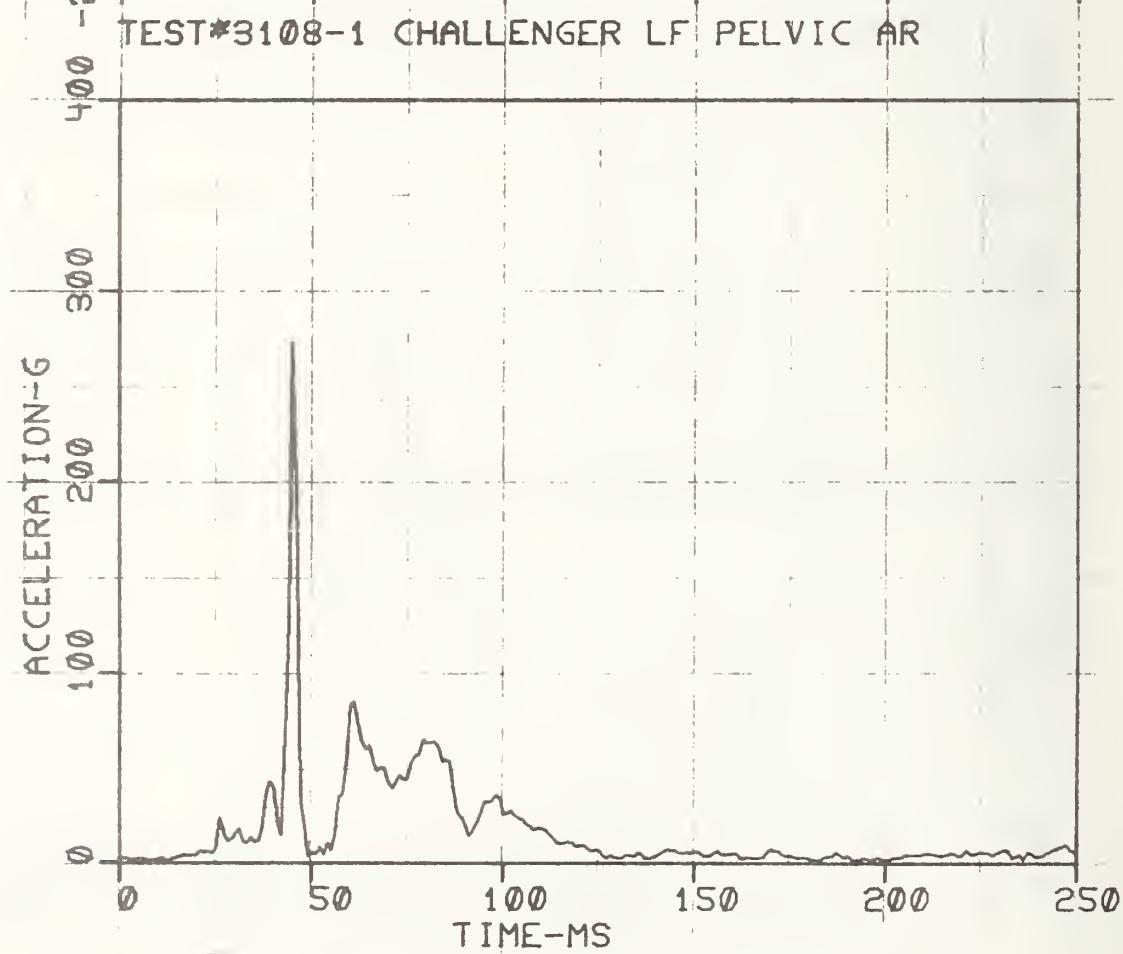
TEST#3108-1 CHALLENGER LF PELVIC AY



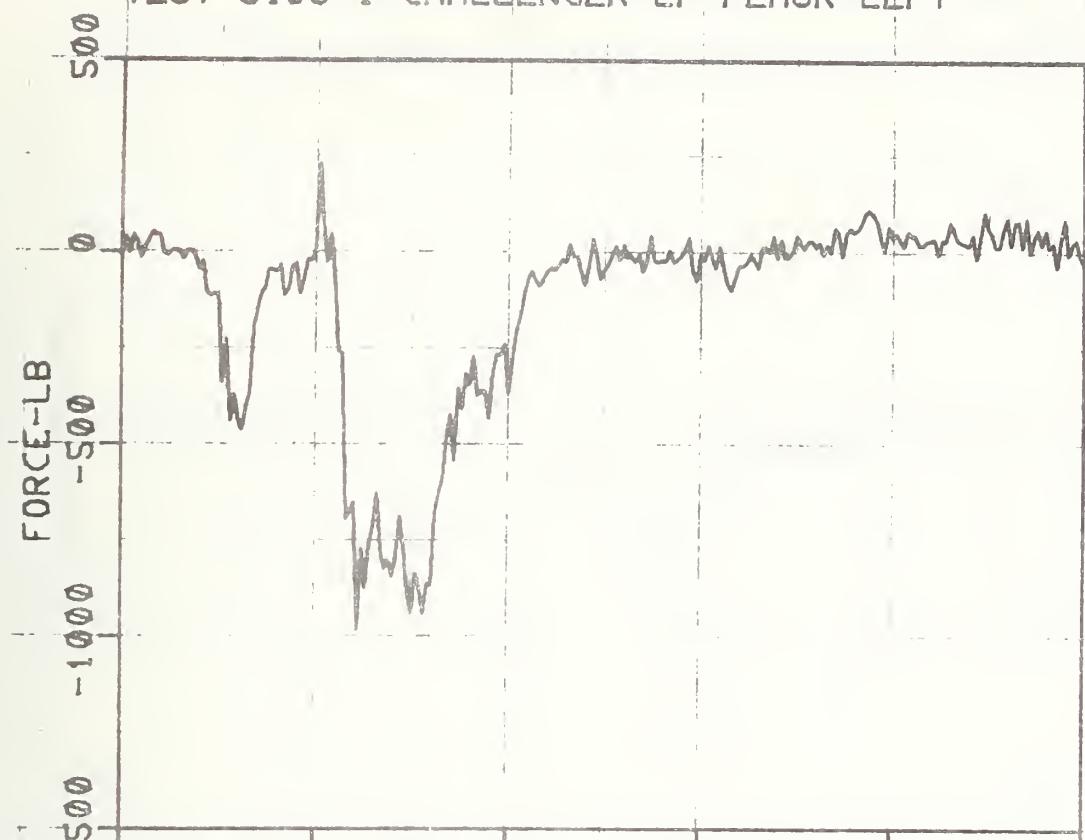
TEST#3108-1 CHALLENGER LF PELVIC AZ



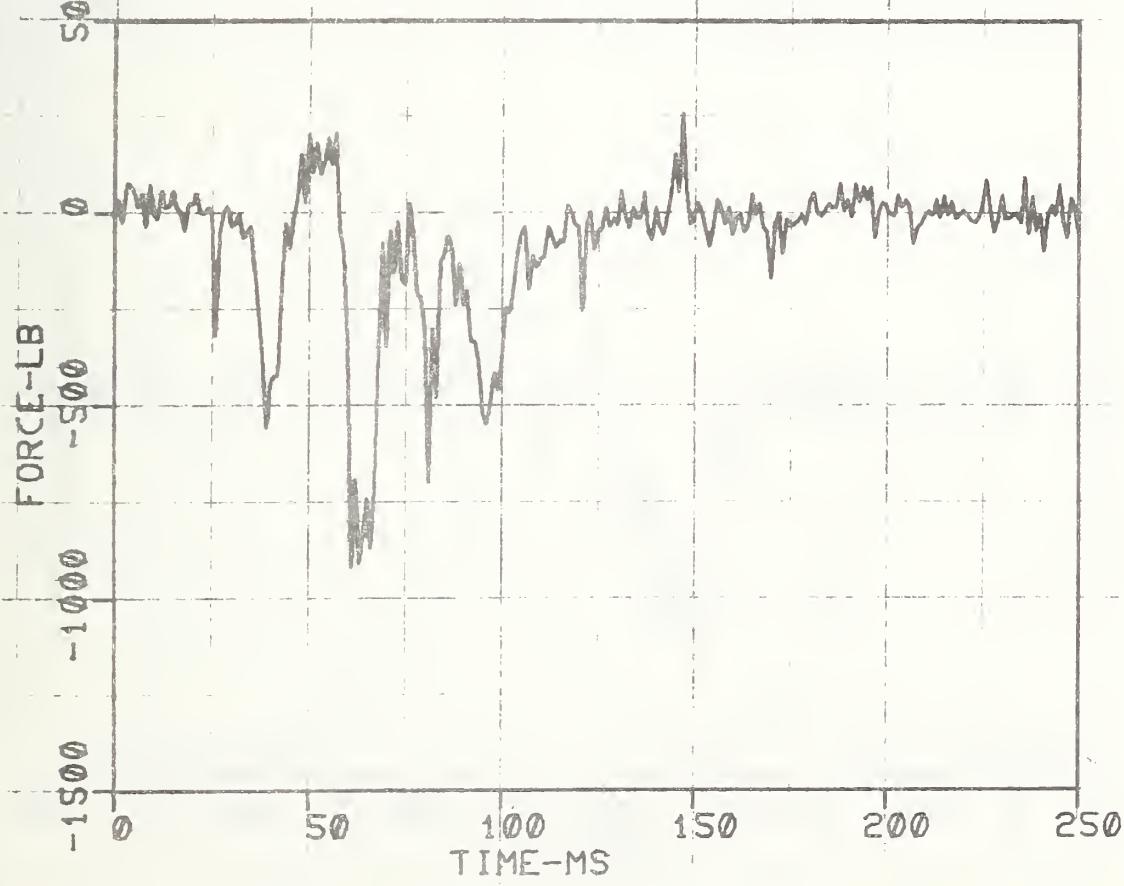
TEST#3108-1 CHALLENGER LF PELVIC AR

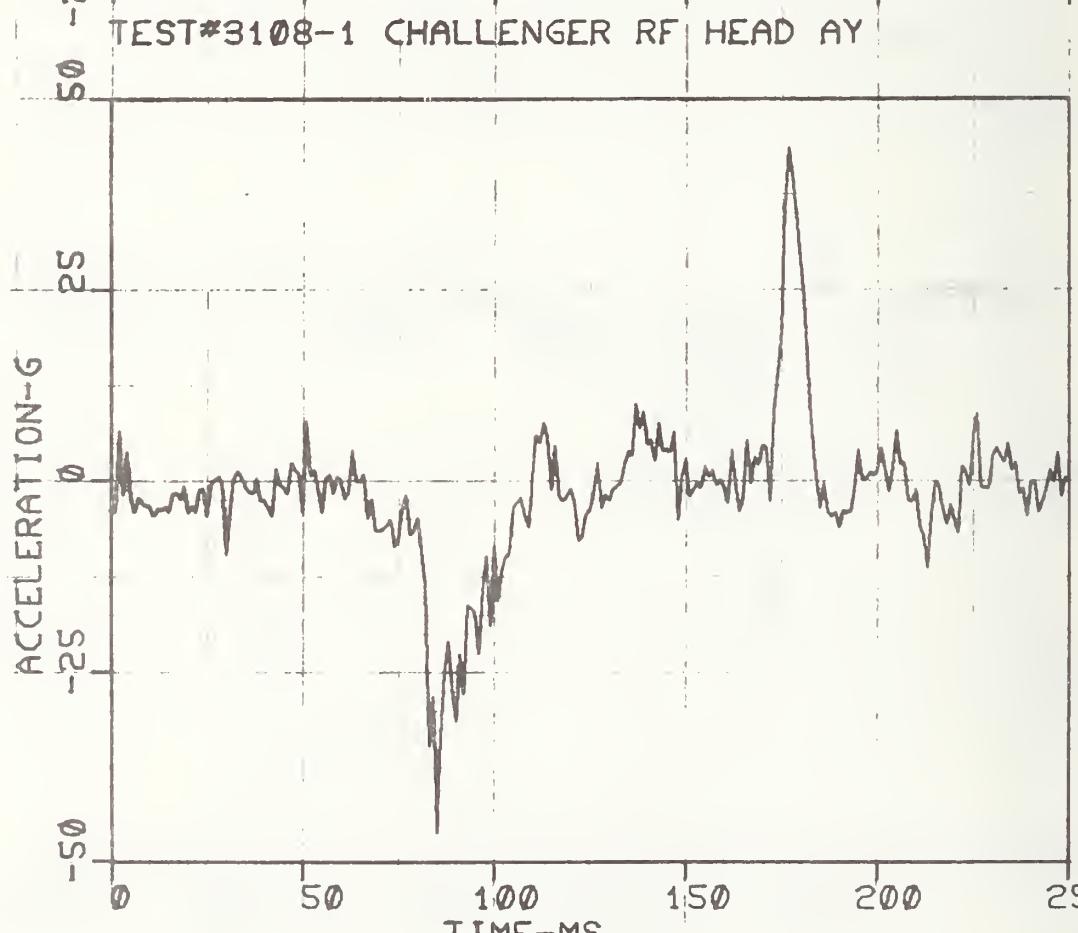
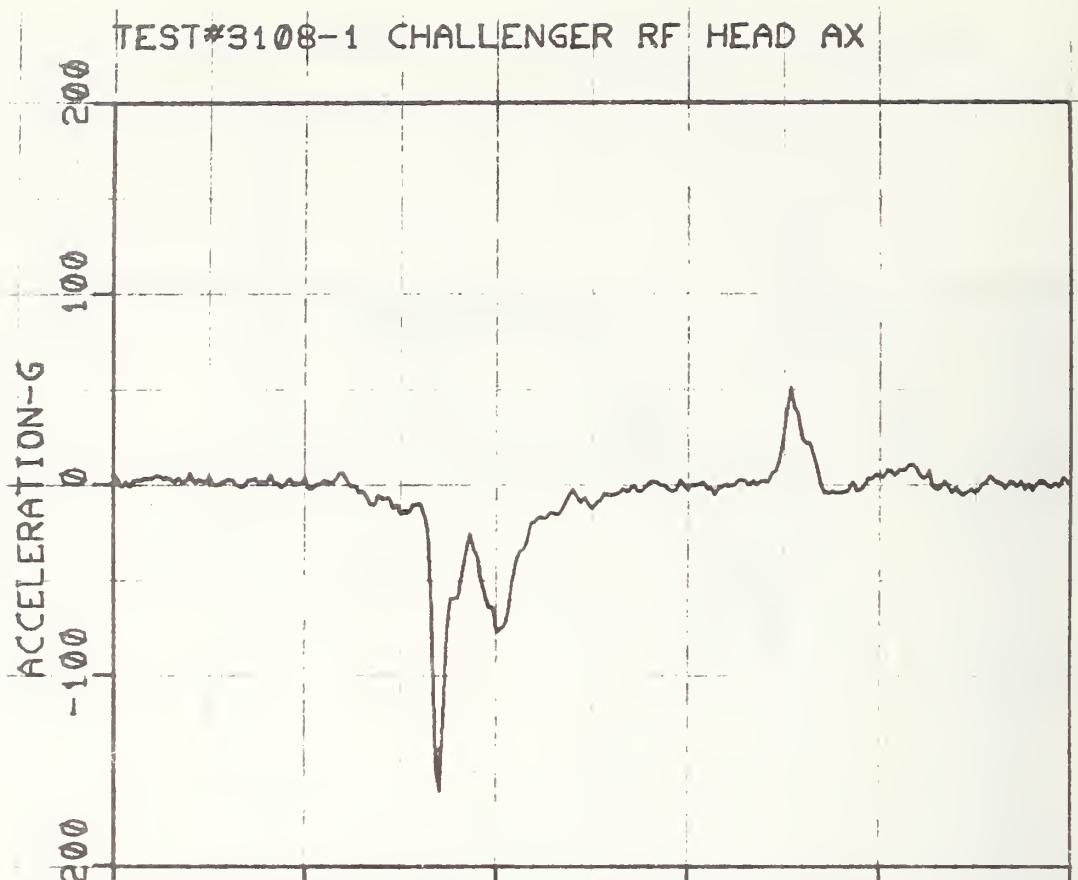


TEST#3108-1 CHALLENGER LF FEMUR LEFT



TEST#3108-1 CHALLENGER LF FEMUR RIGHT

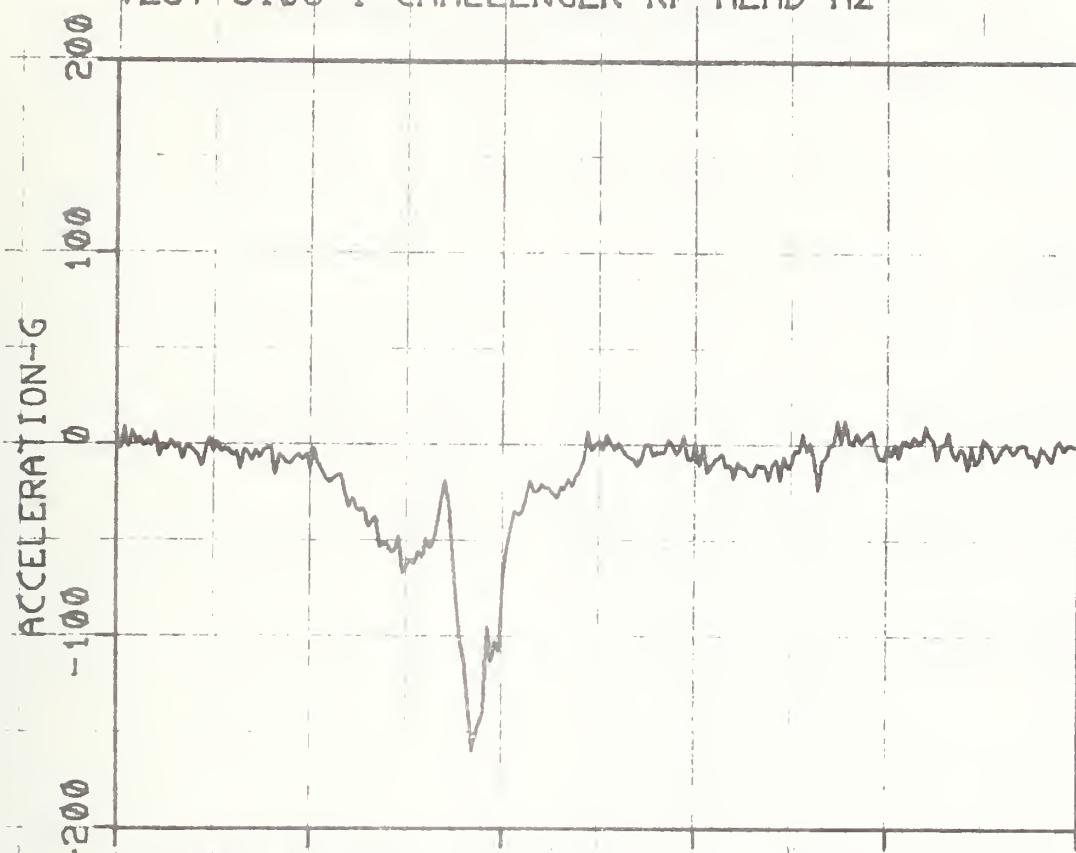




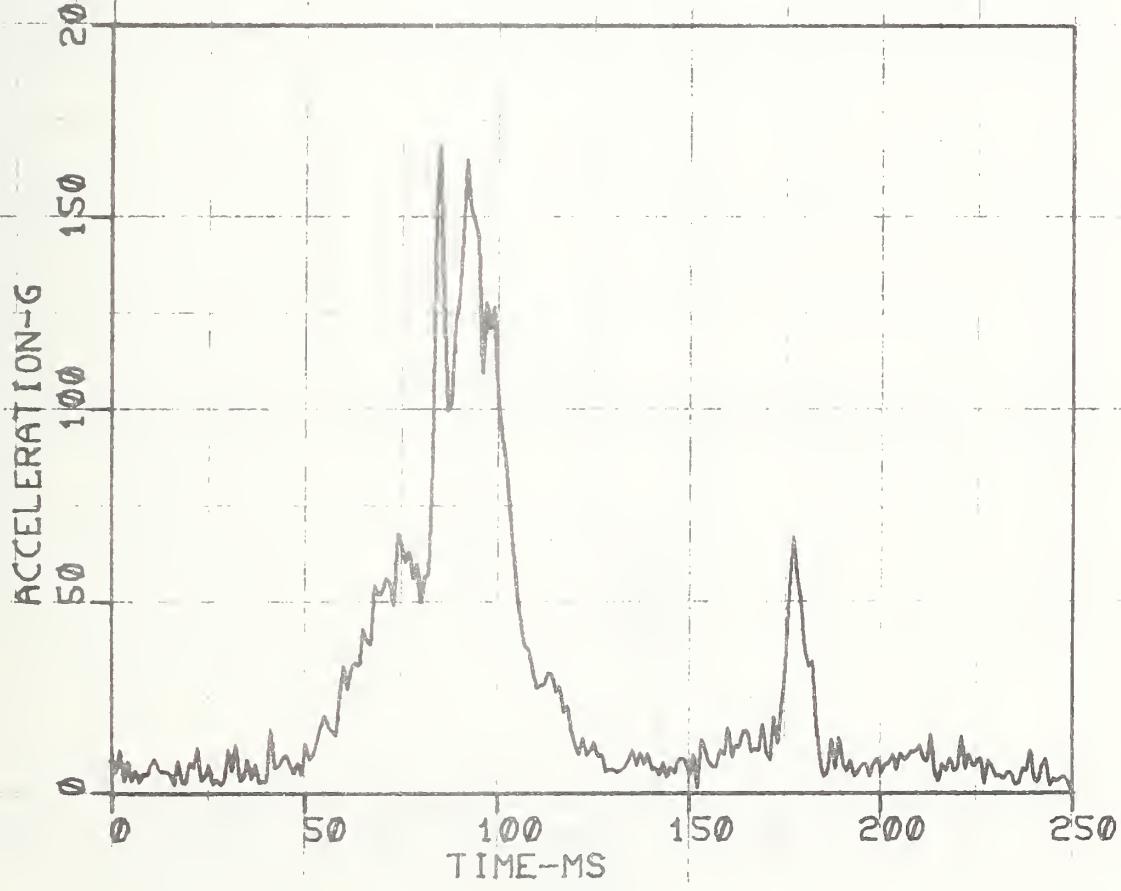
TIME-MS

B-14

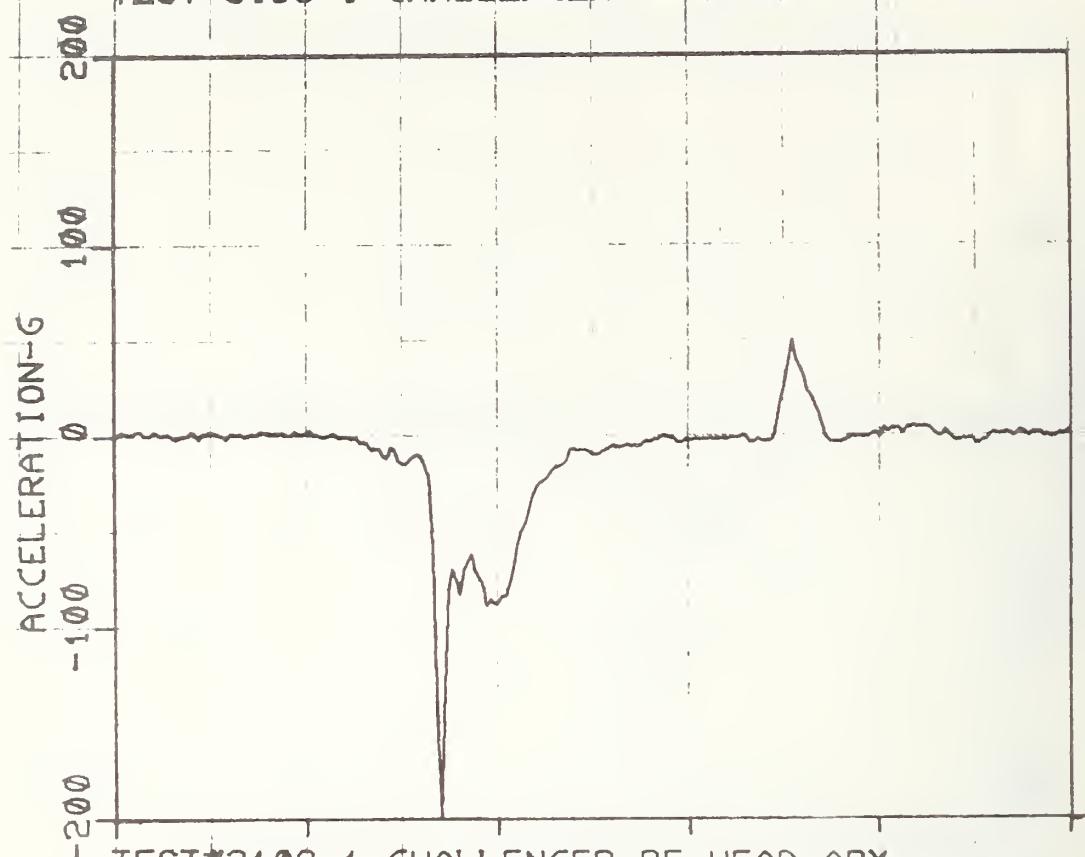
TEST#3108-1 CHALLENGER RF HEAD AZ



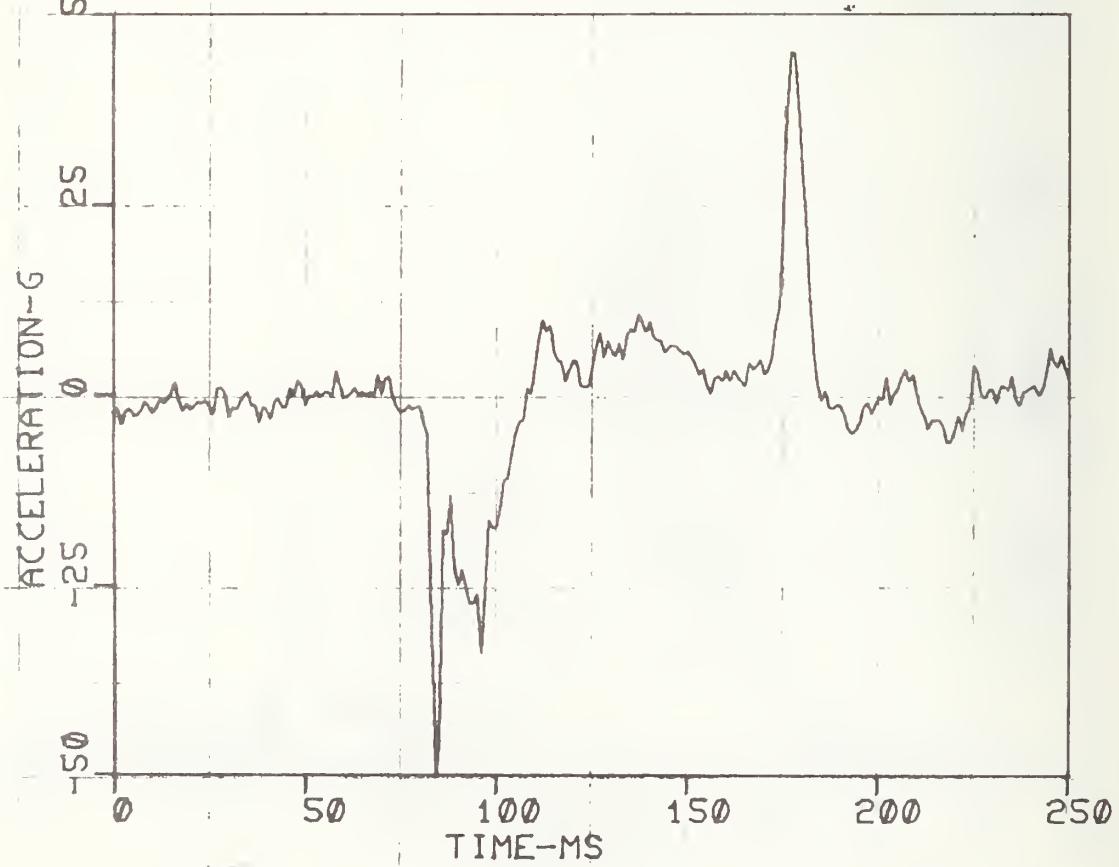
TEST#3108-1 CHALLENGER RF HEAD AR



TEST#3108-1 CHALLENGER RF HEAD ARX

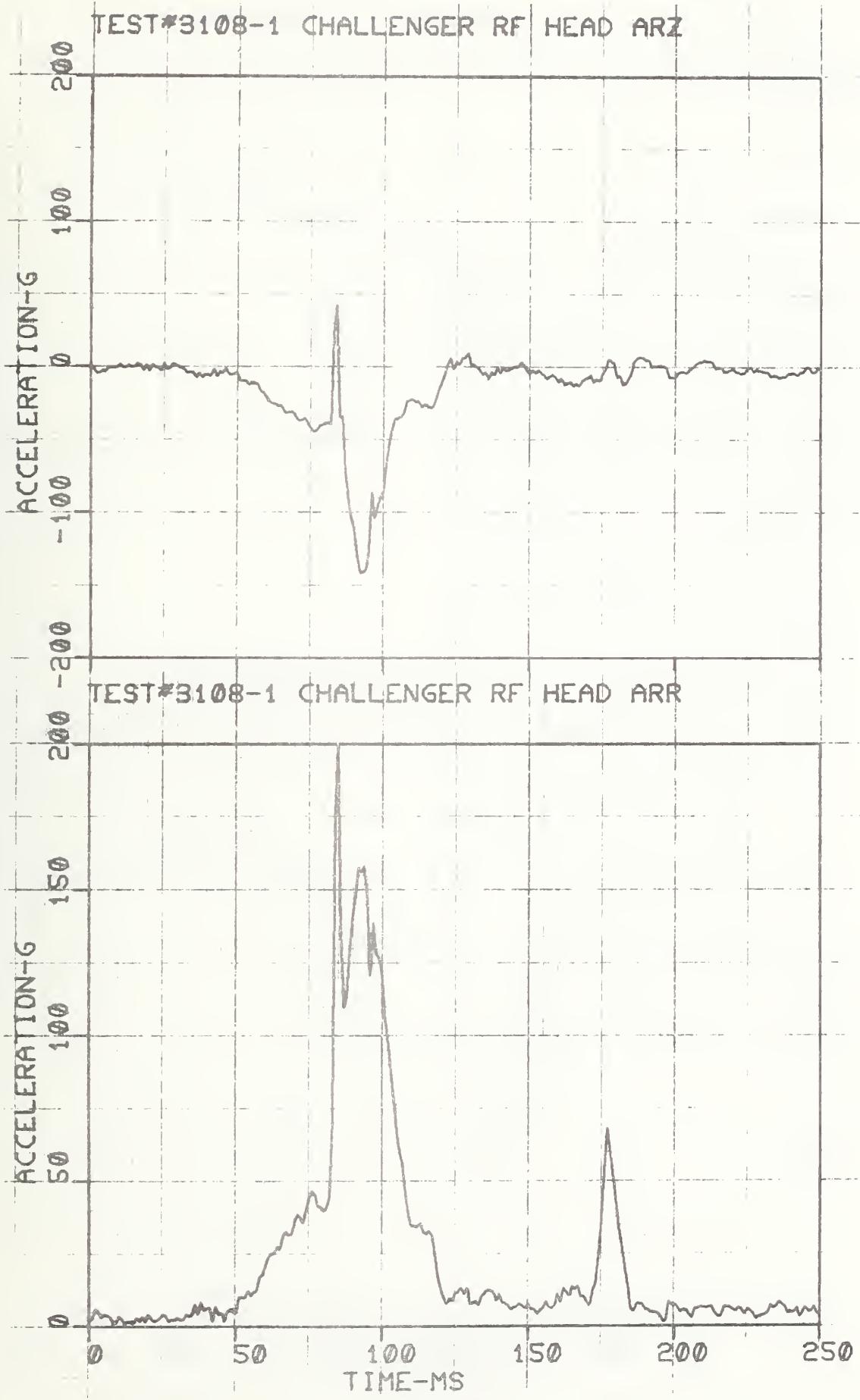


TEST#3108-1 CHALLENGER RF HEAD ARY

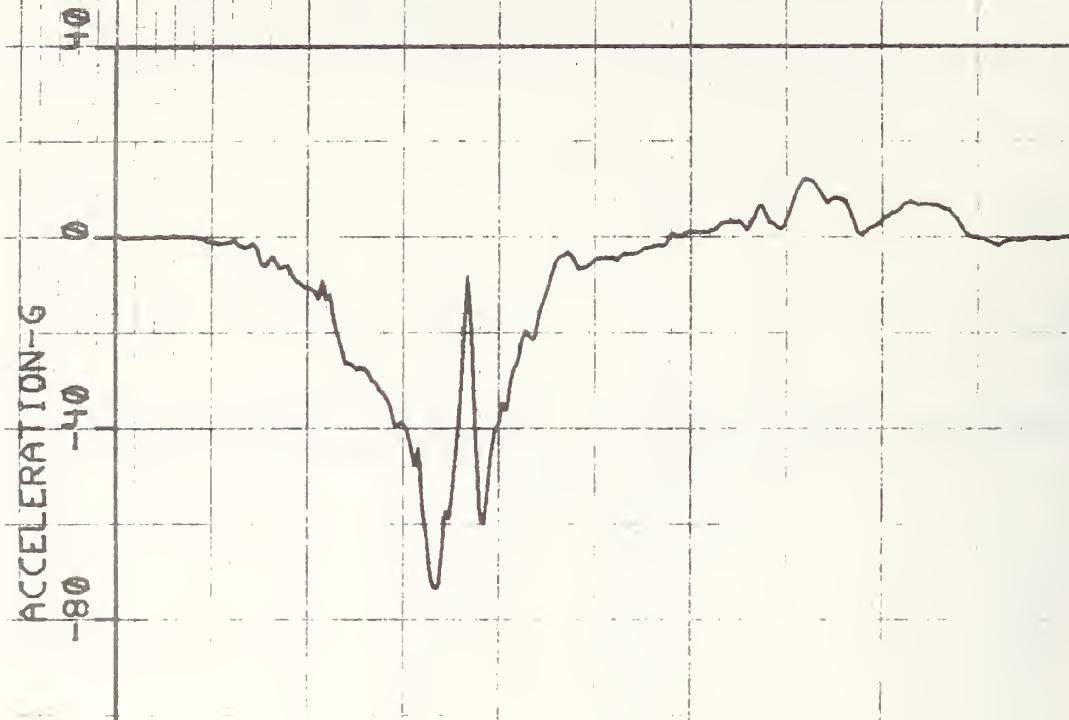


TIME-MS

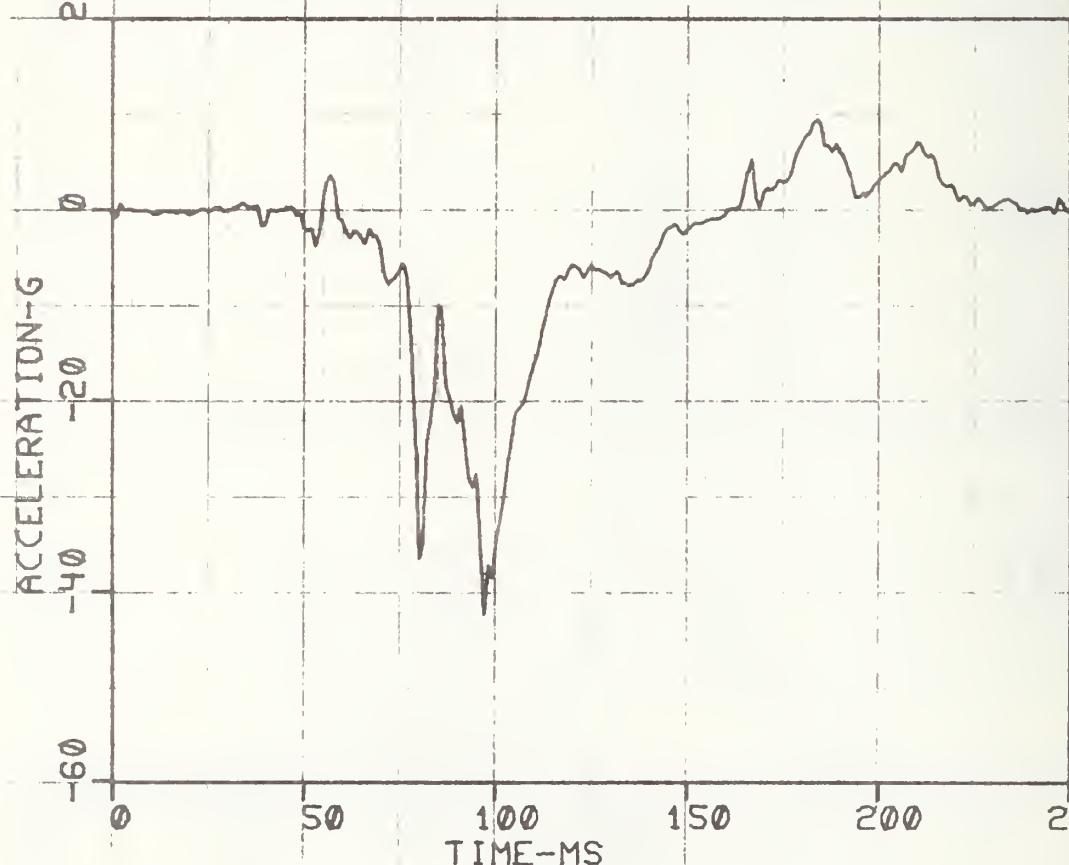
B-16



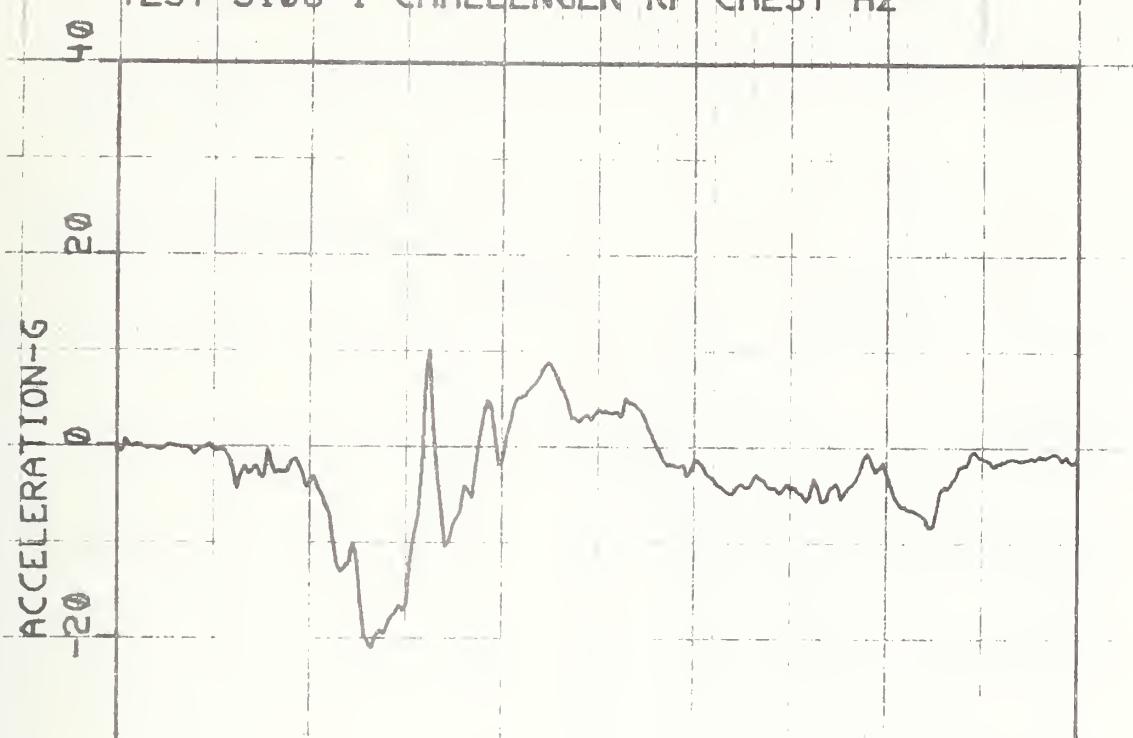
TEST#3108-1 CHALLENGER RF CHEST AX



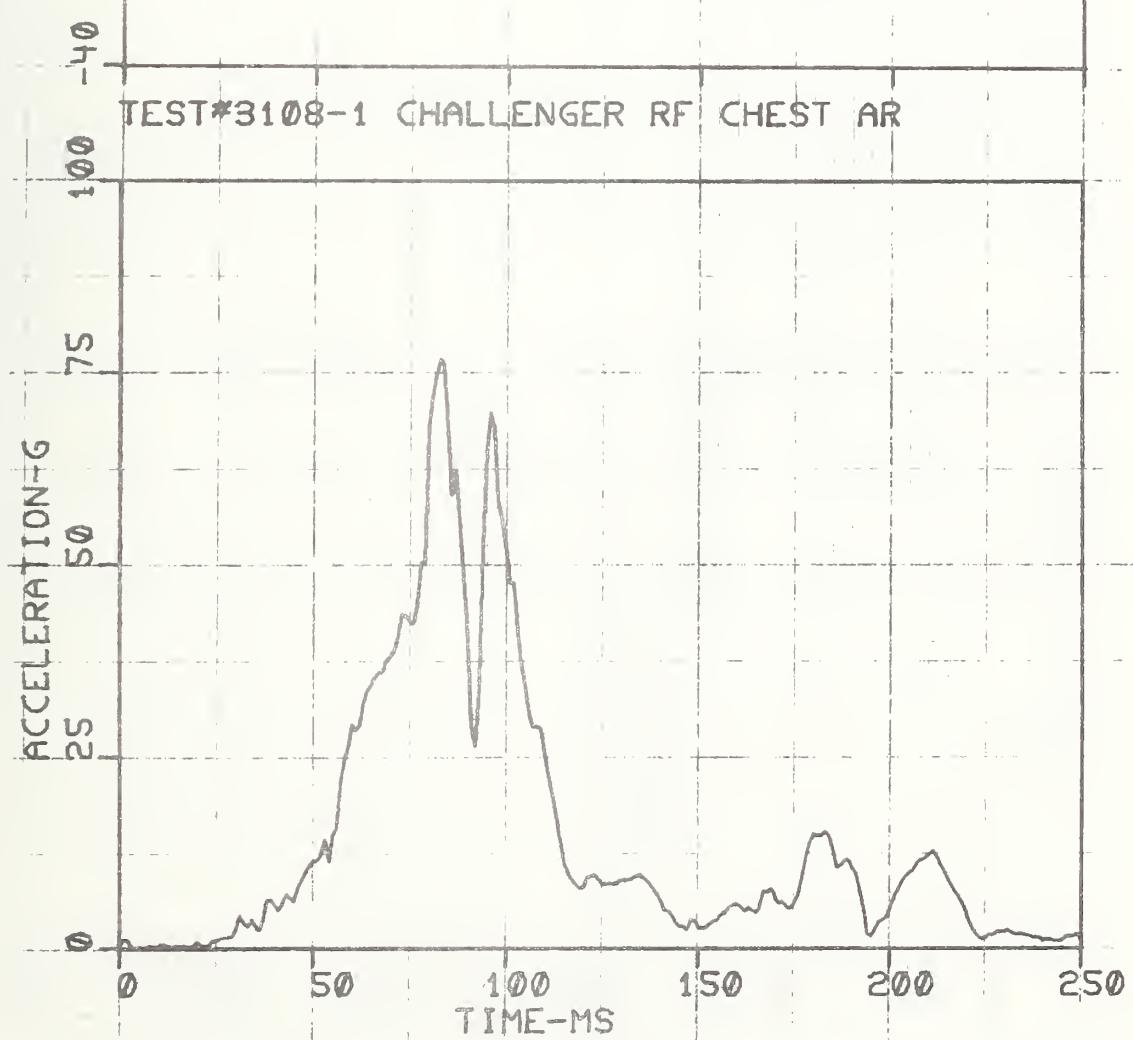
TEST#3108-1 CHALLENGER RF CHEST AY



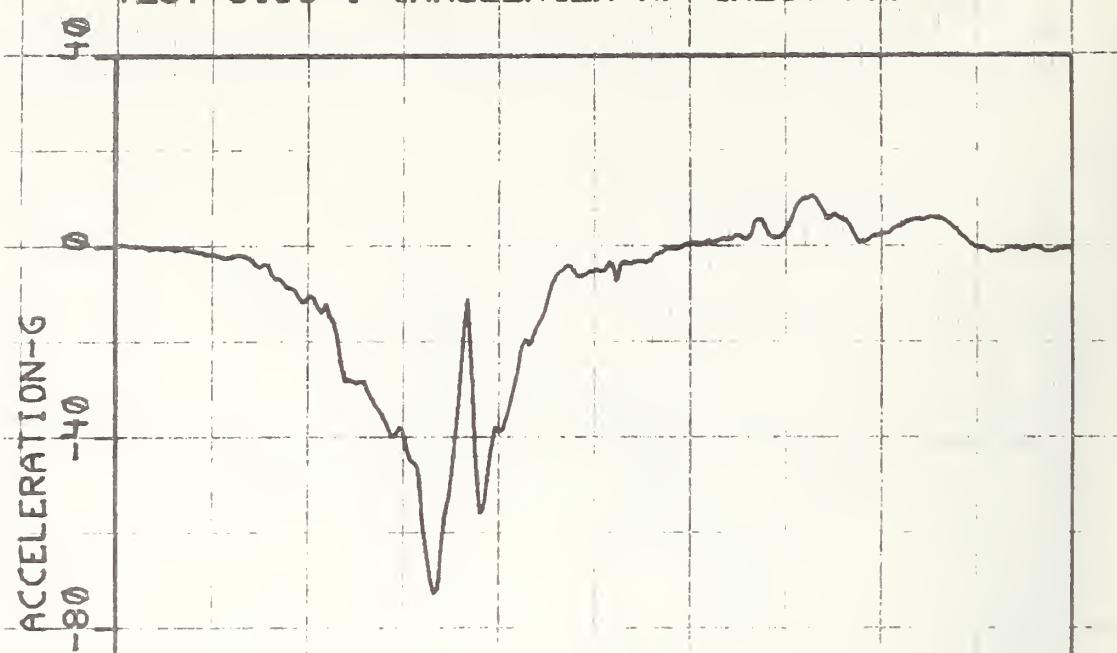
TEST#3108-1 CHALLENGER RF CHEST AZ



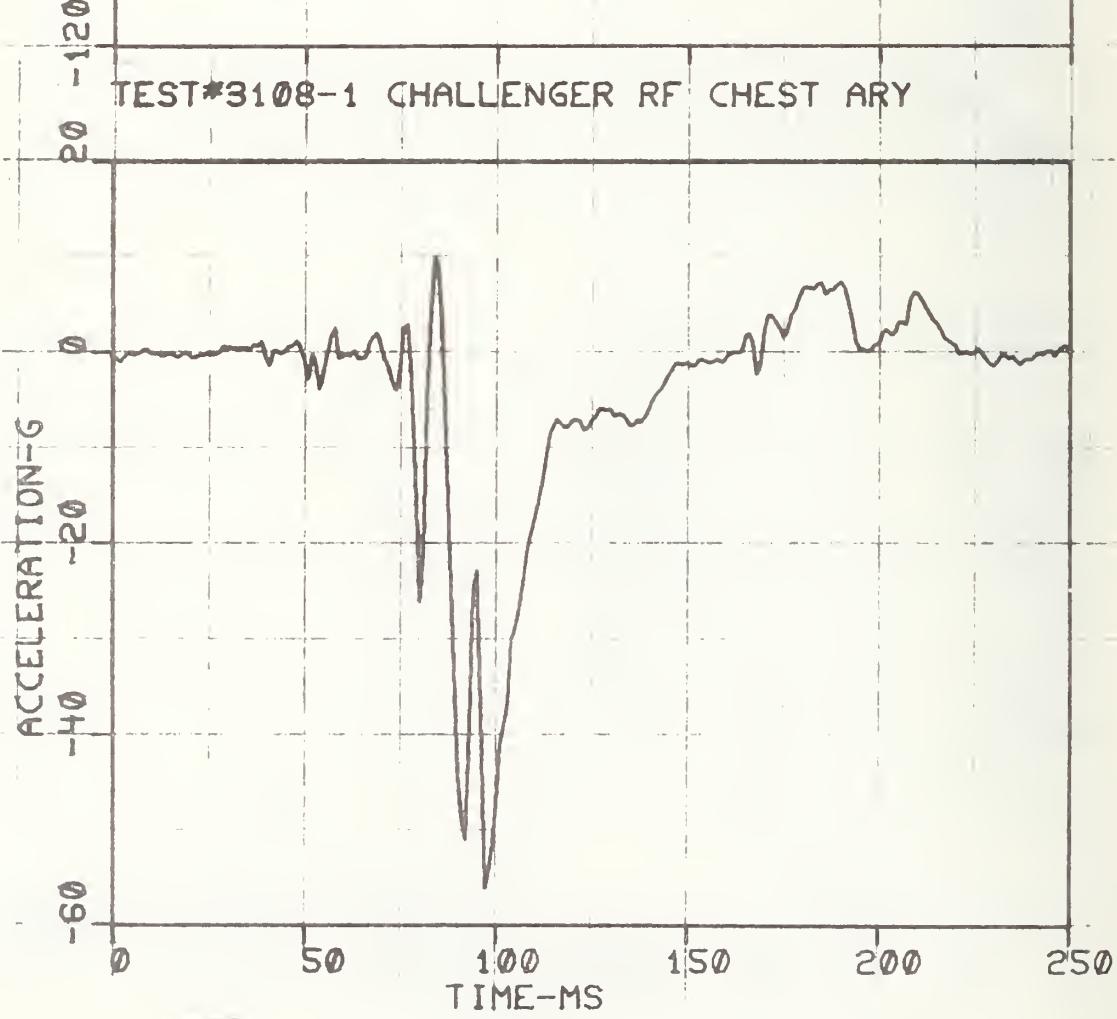
TEST#3108-1 CHALLENGER RF CHEST AR



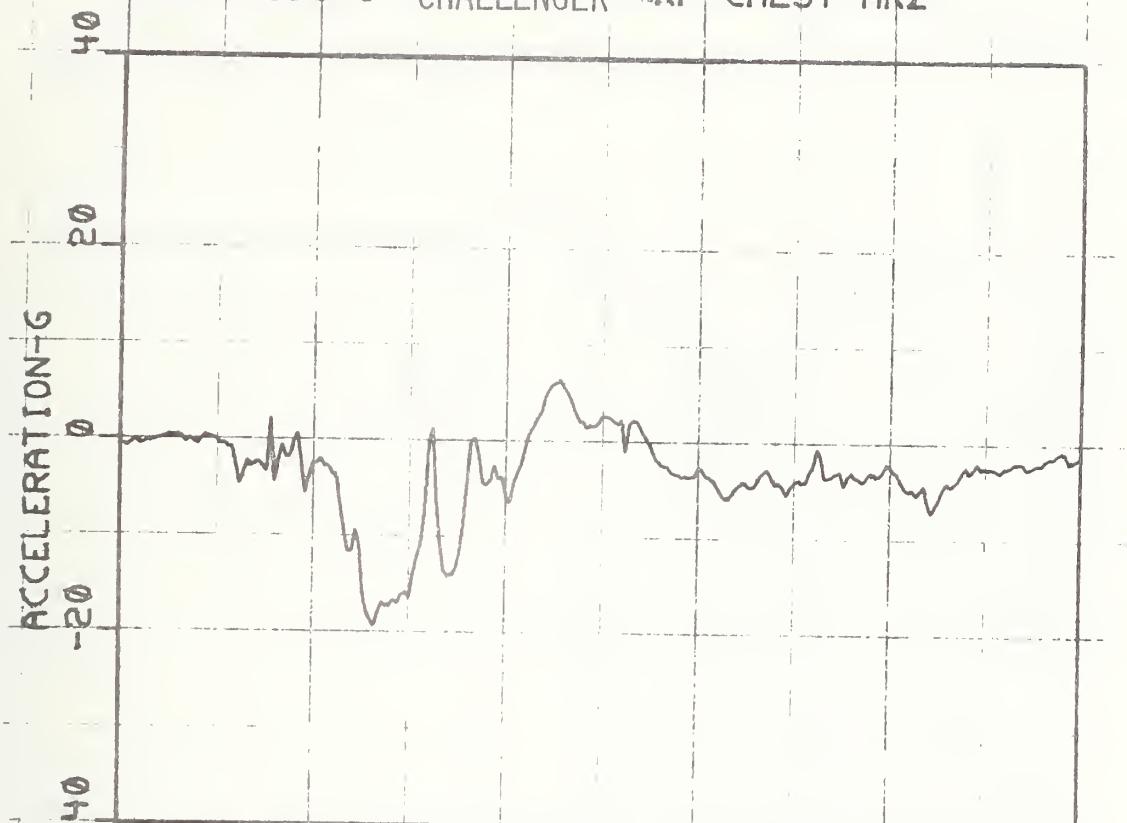
TEST#3108-1 CHALLENGER RF CHEST ARX



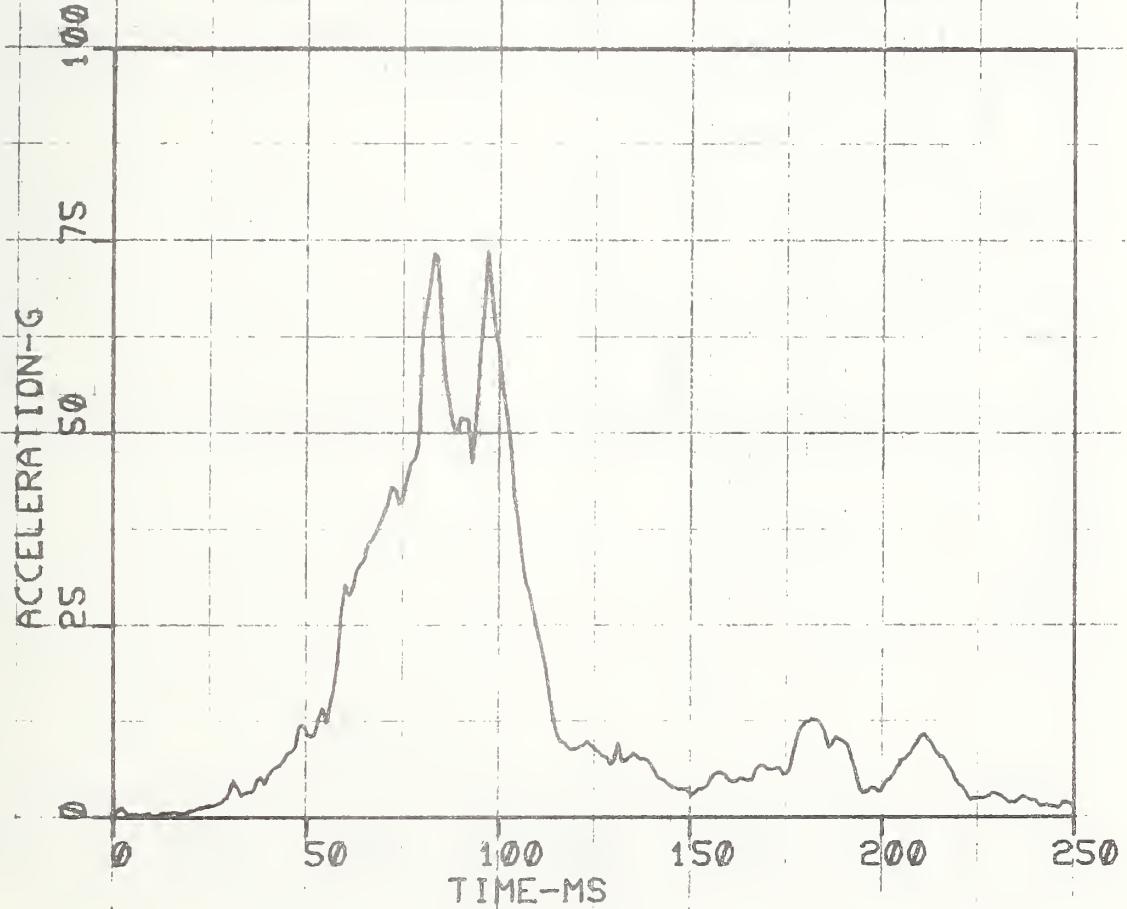
TEST#3108-1 CHALLENGER RF CHEST ARY



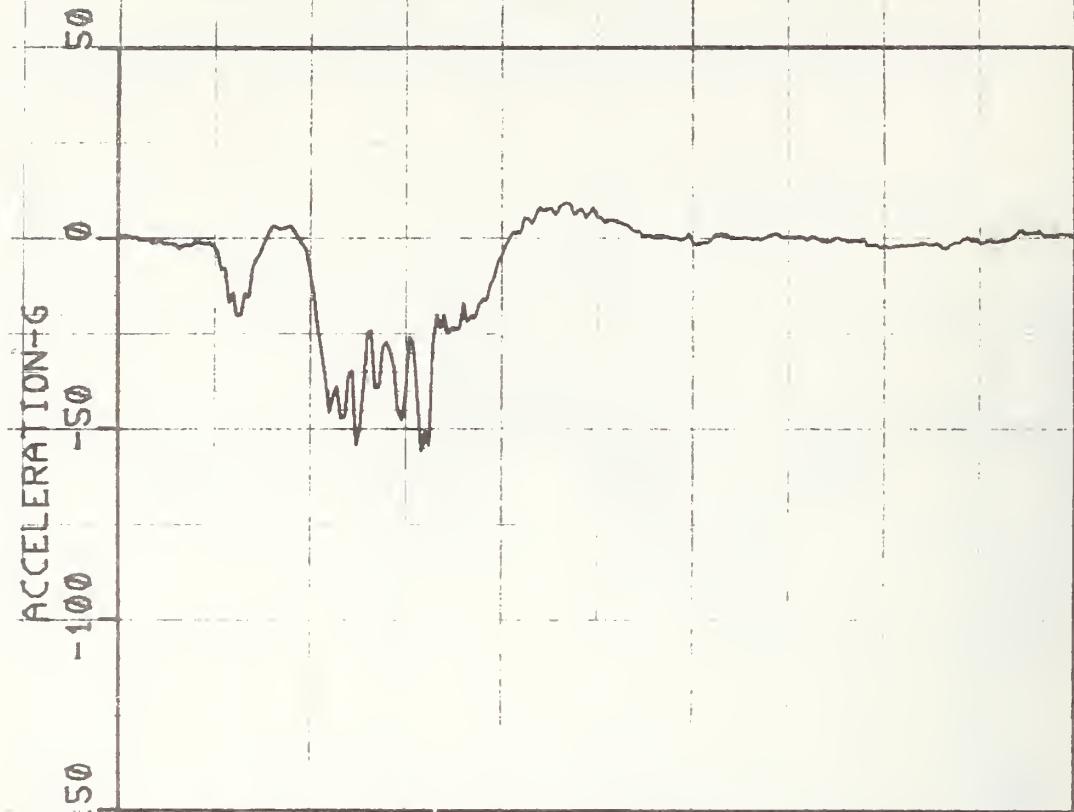
TEST#3108-1 CHALLENGER RF CHEST ARZ



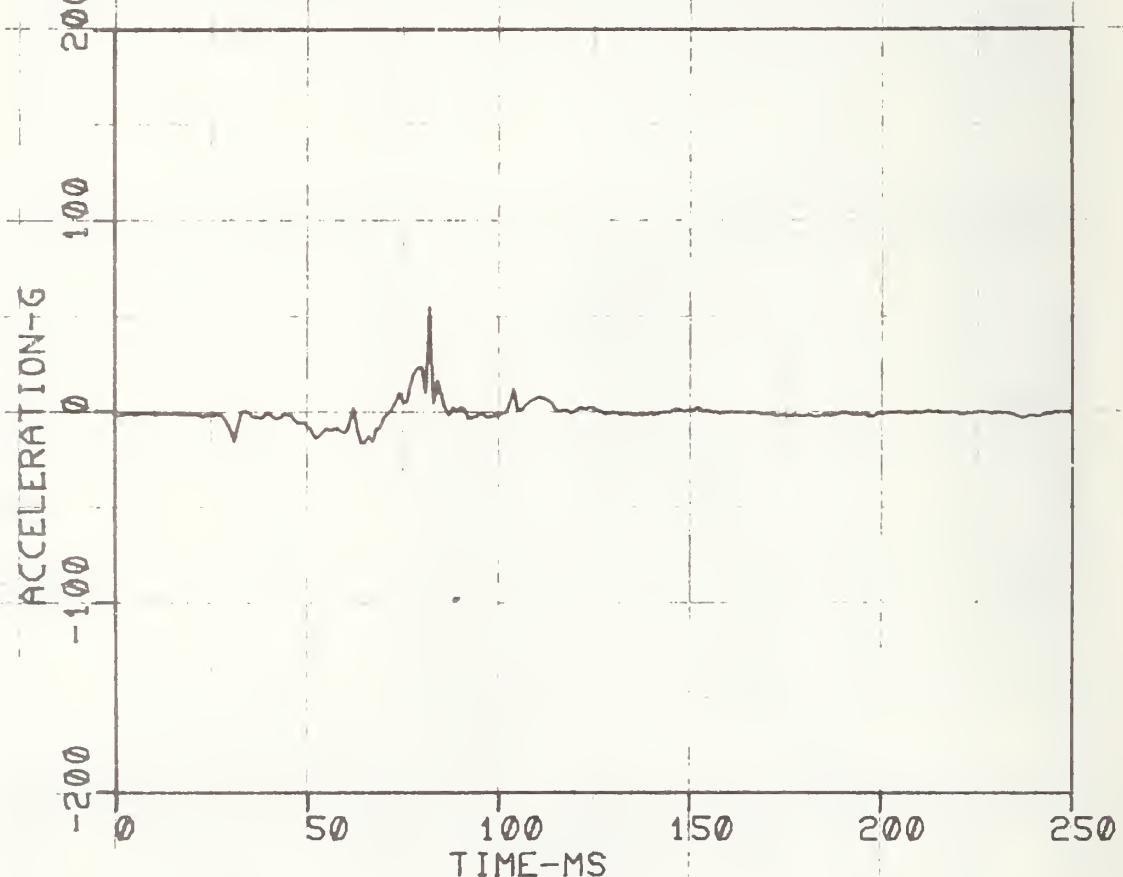
TEST#3108-1 CHALLENGER RF CHEST ARR



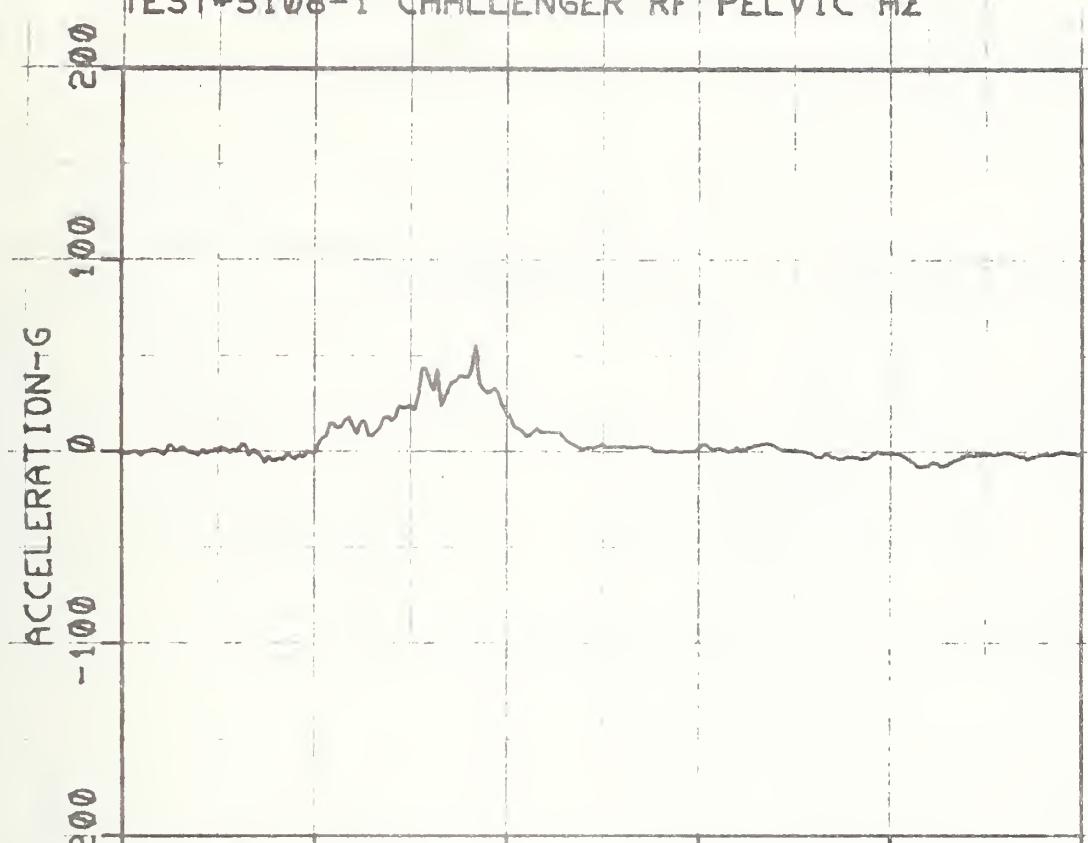
TEST#3108-1 CHALLENGER RF PELVIC AX



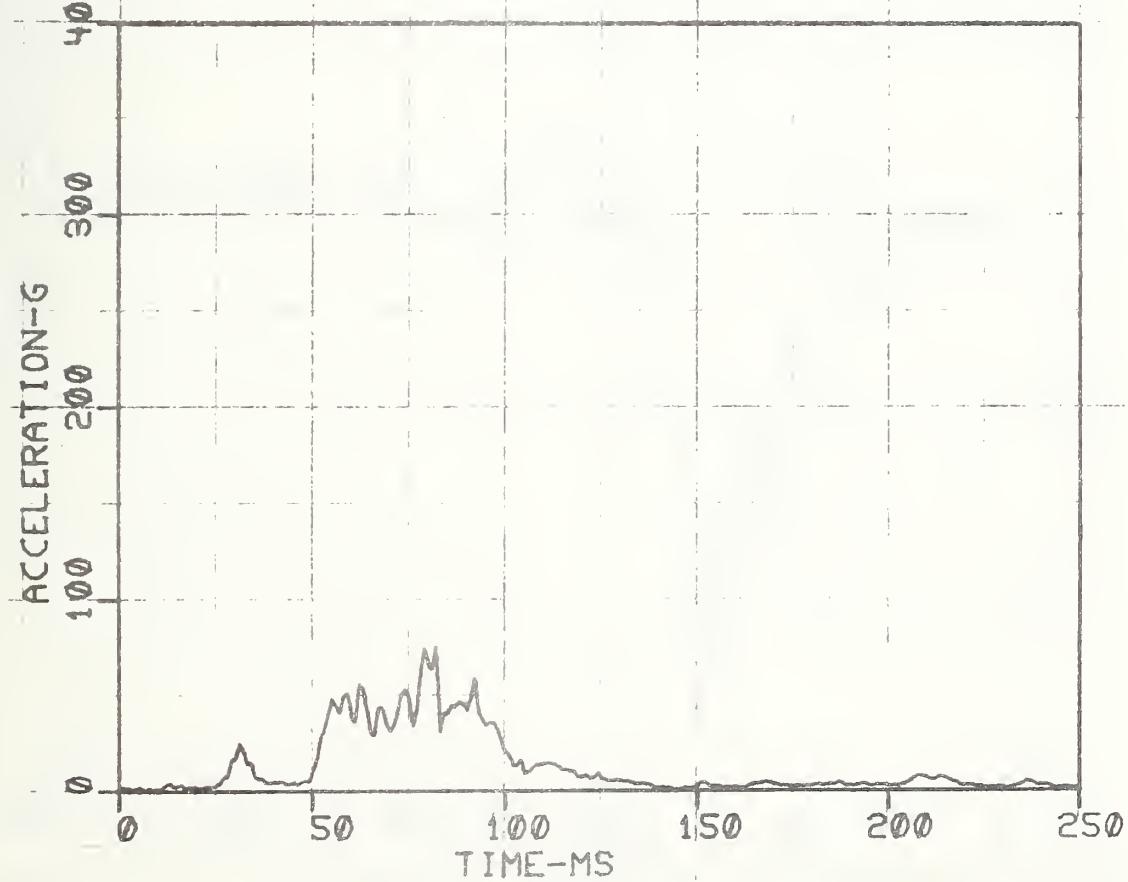
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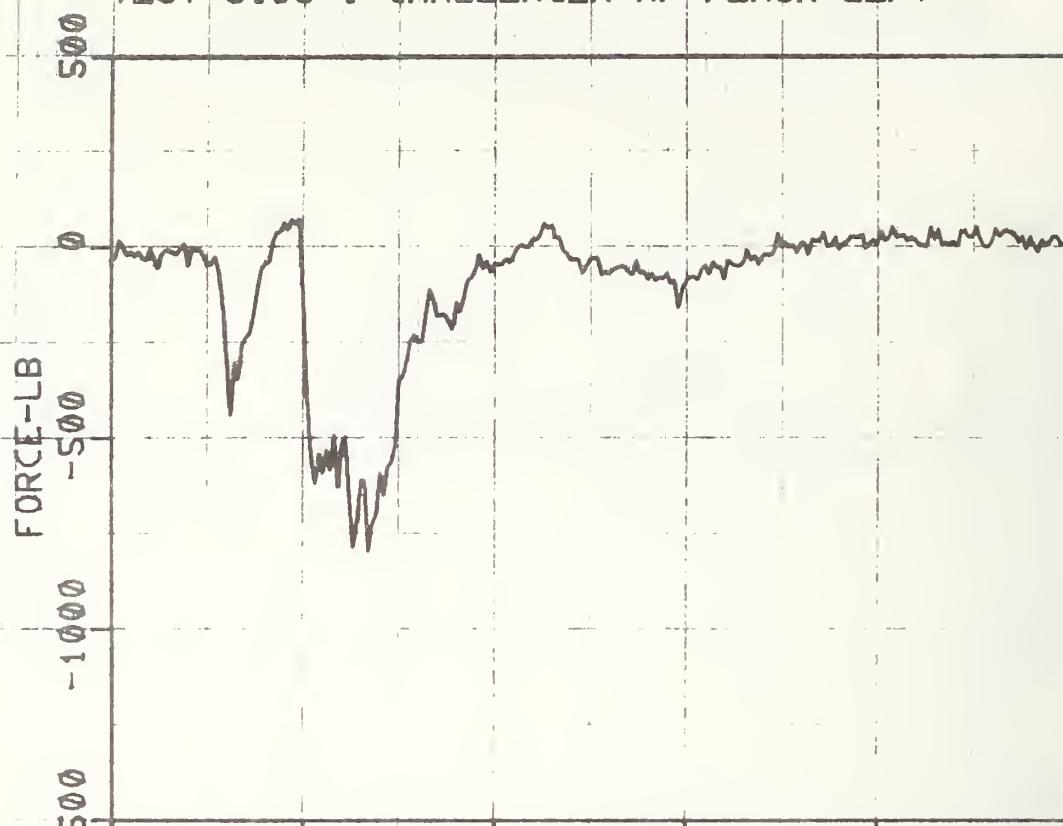
TEST#3108-1 CHALLENGER RF PELVIC AZ



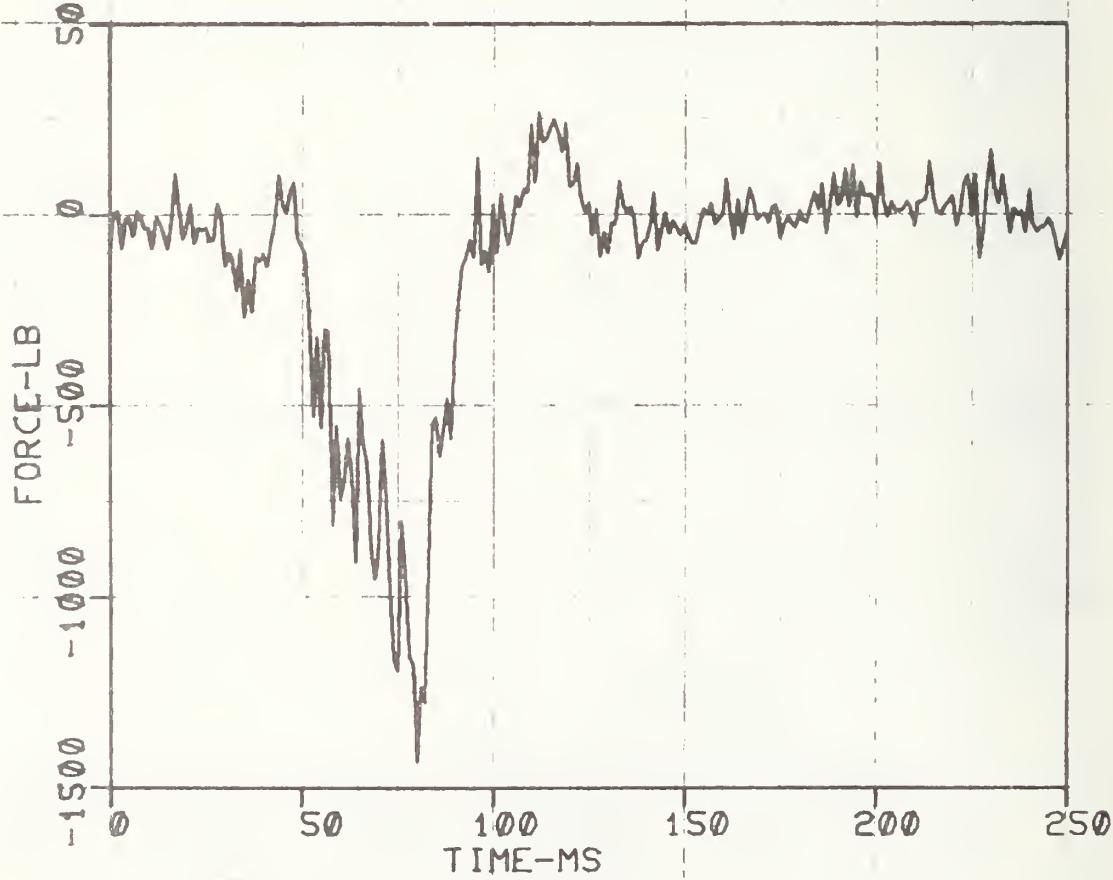
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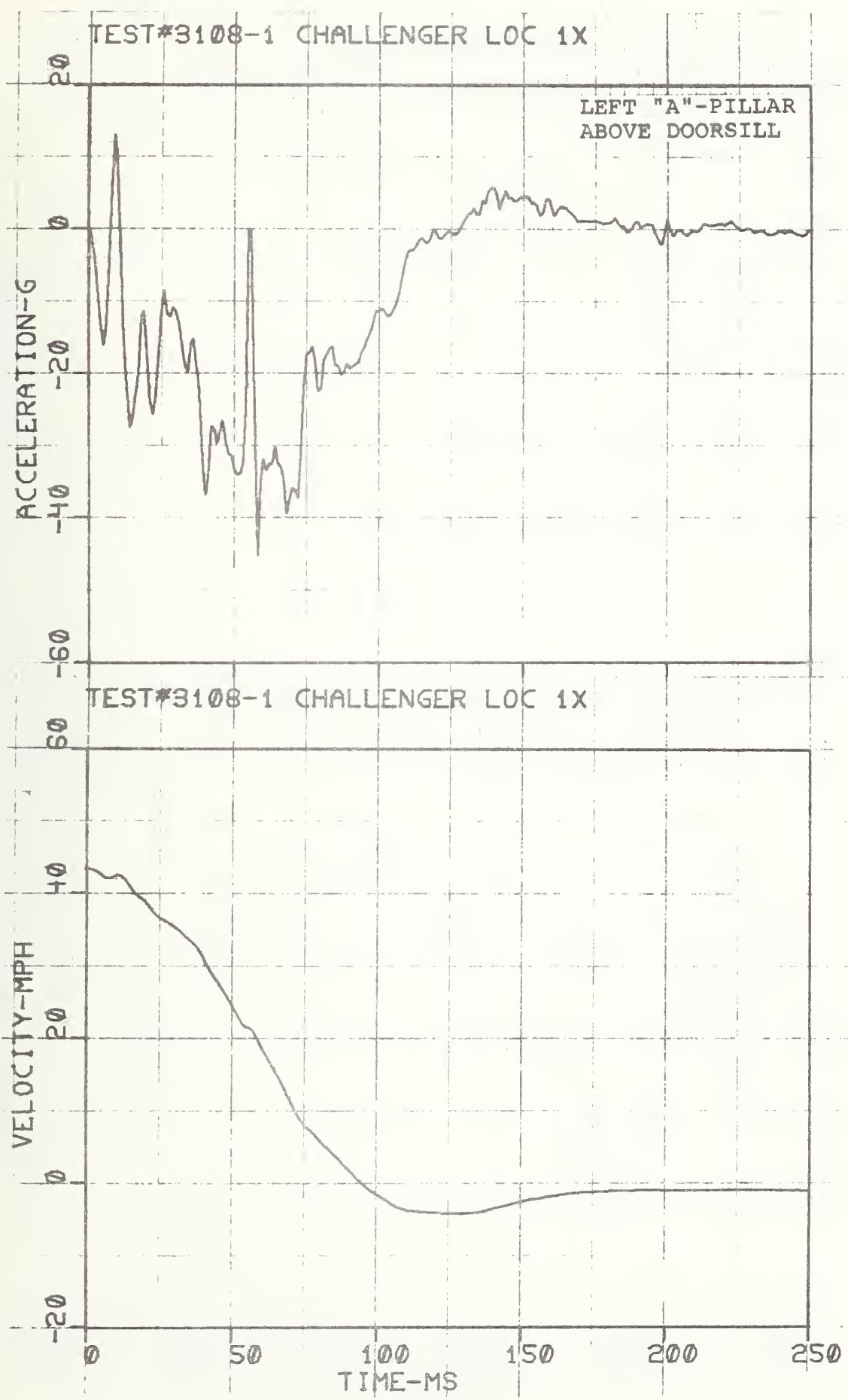


TEST#3108-1 CHALLENGER RF FEMUR LEFT

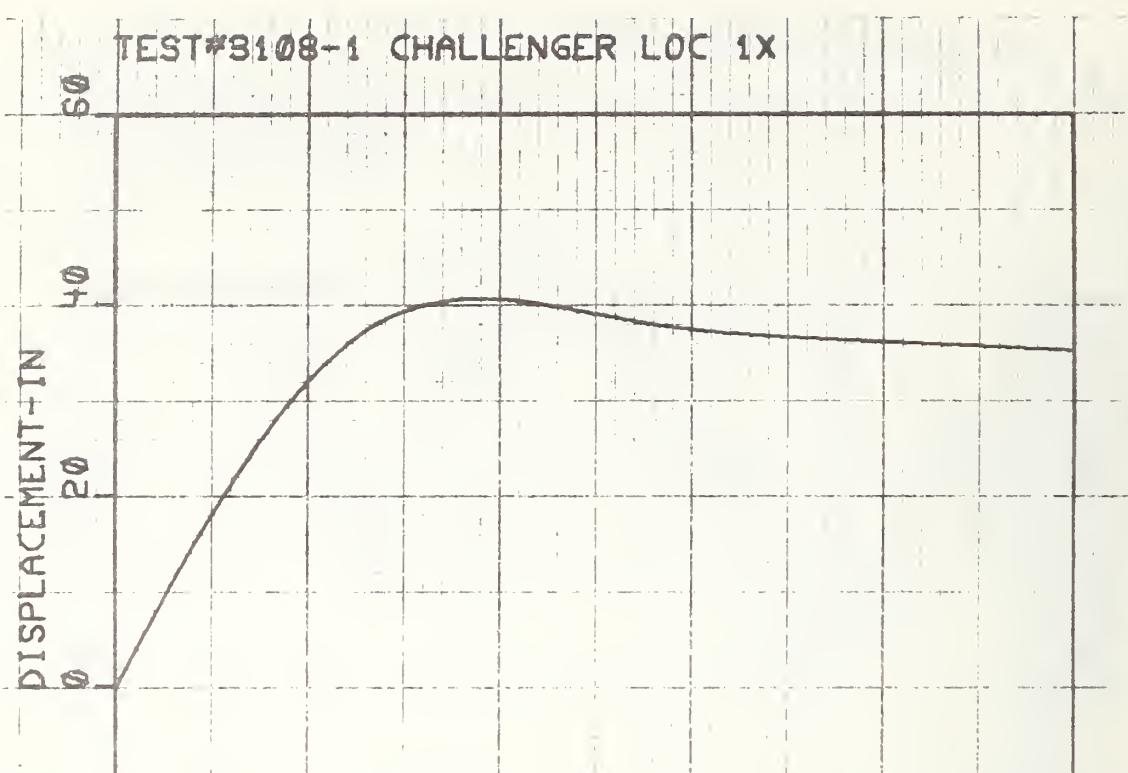


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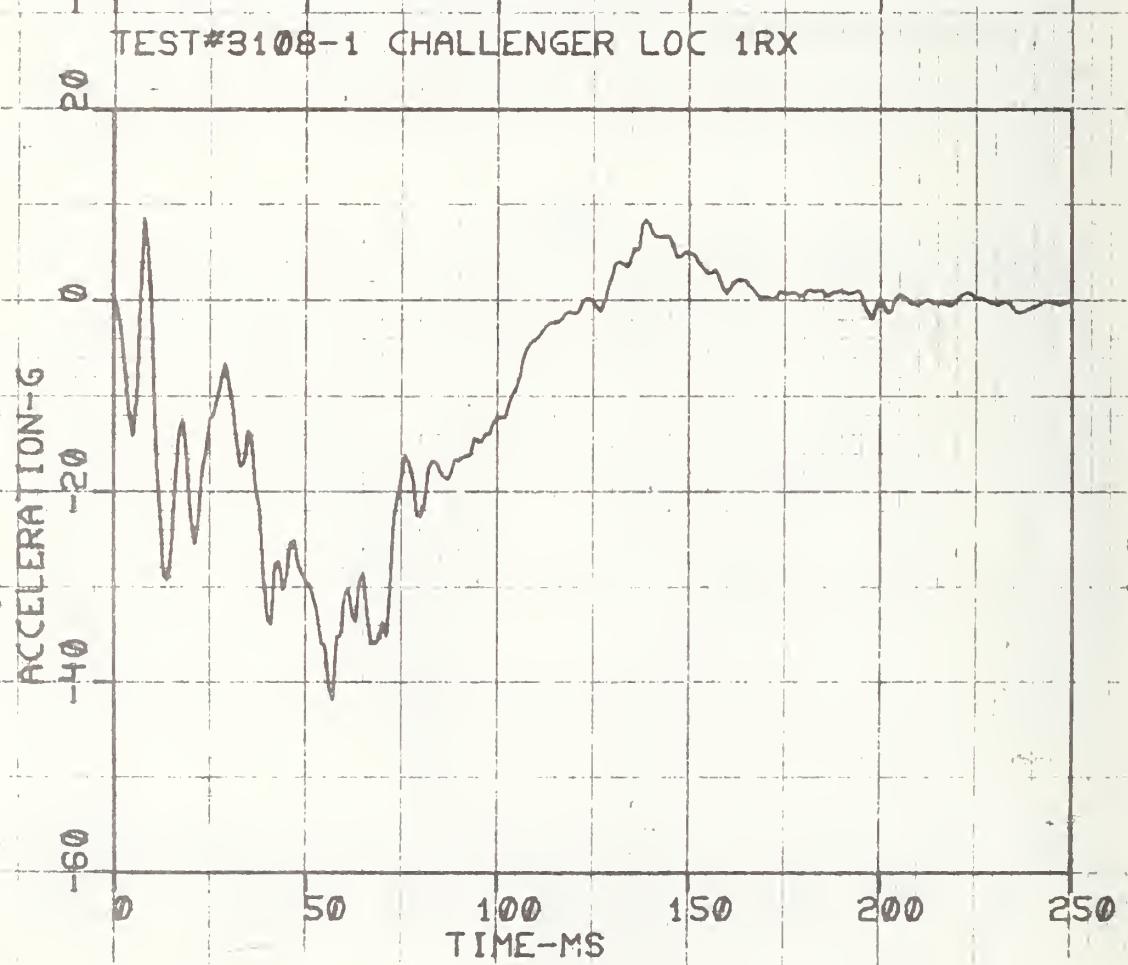




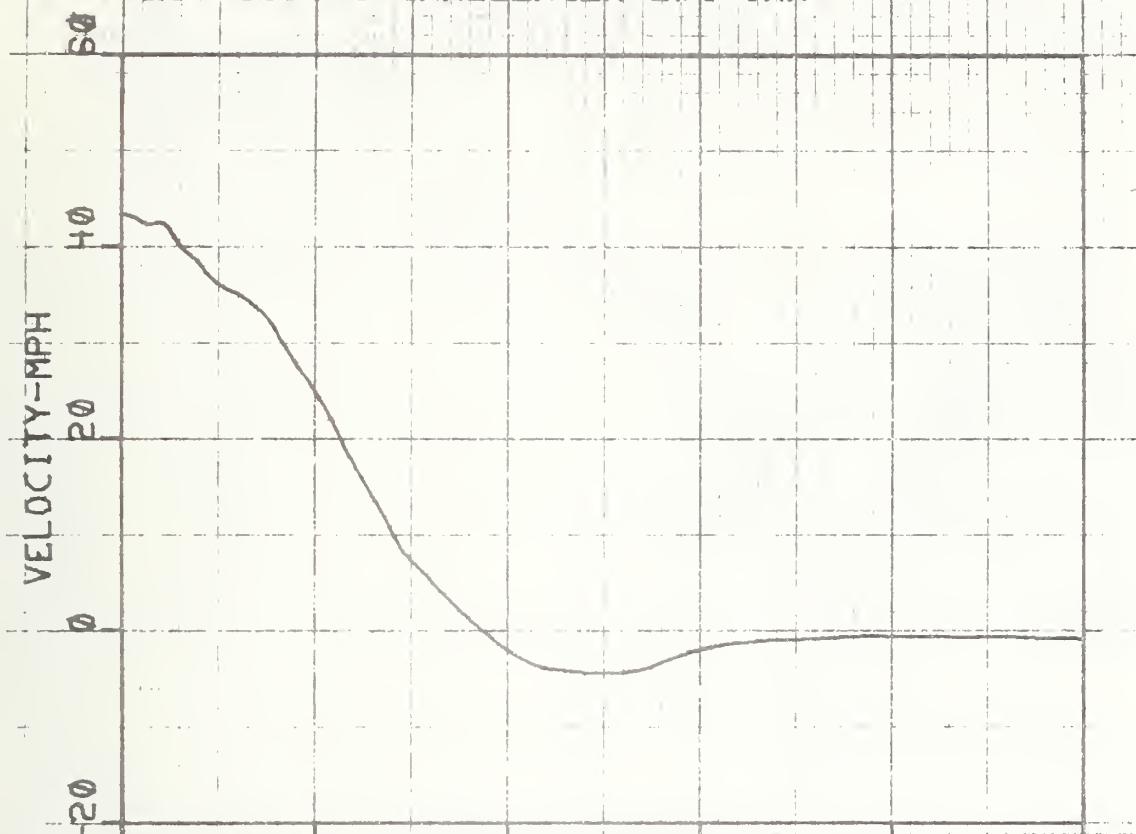
TEST#3108-1 CHALLENGER LOC 1X



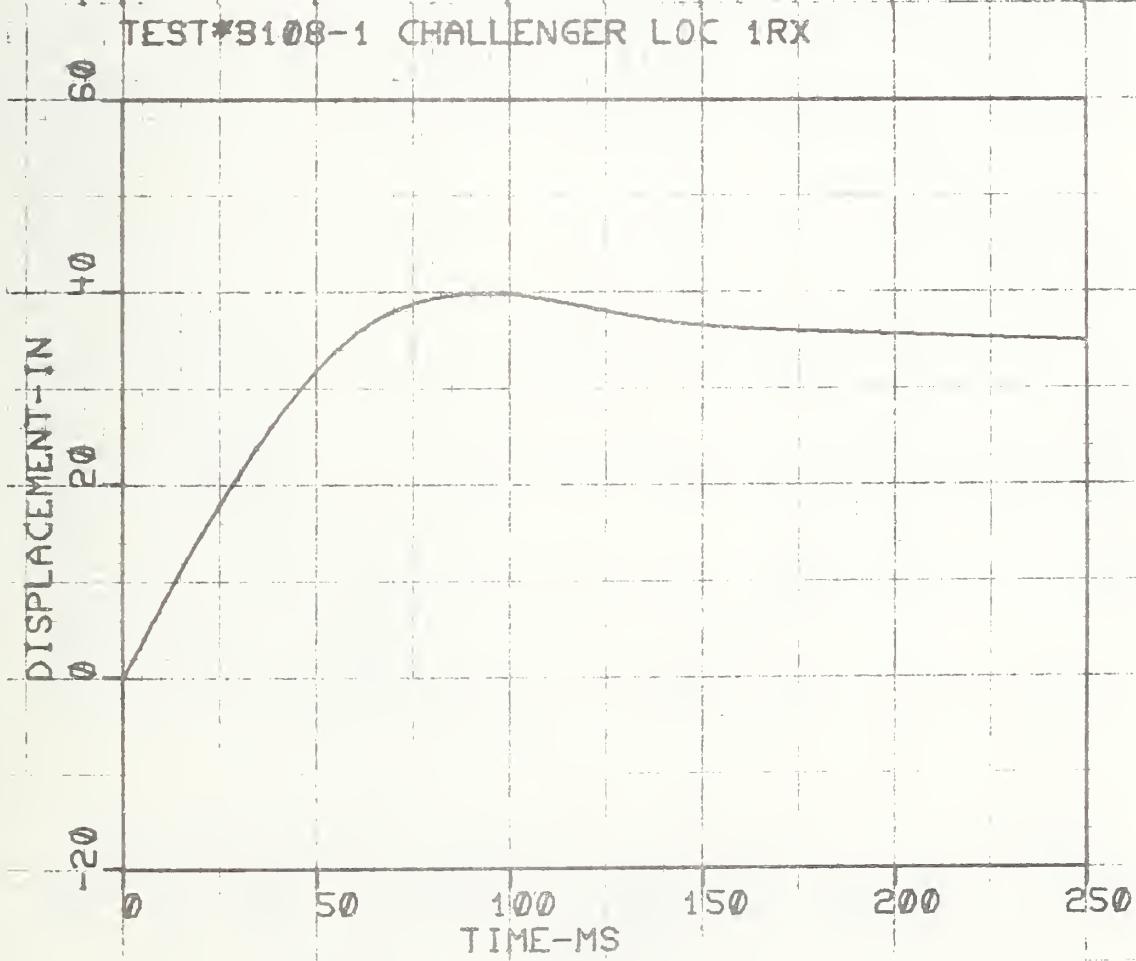
TEST#3108-1 CHALLENGER LOC 1RX

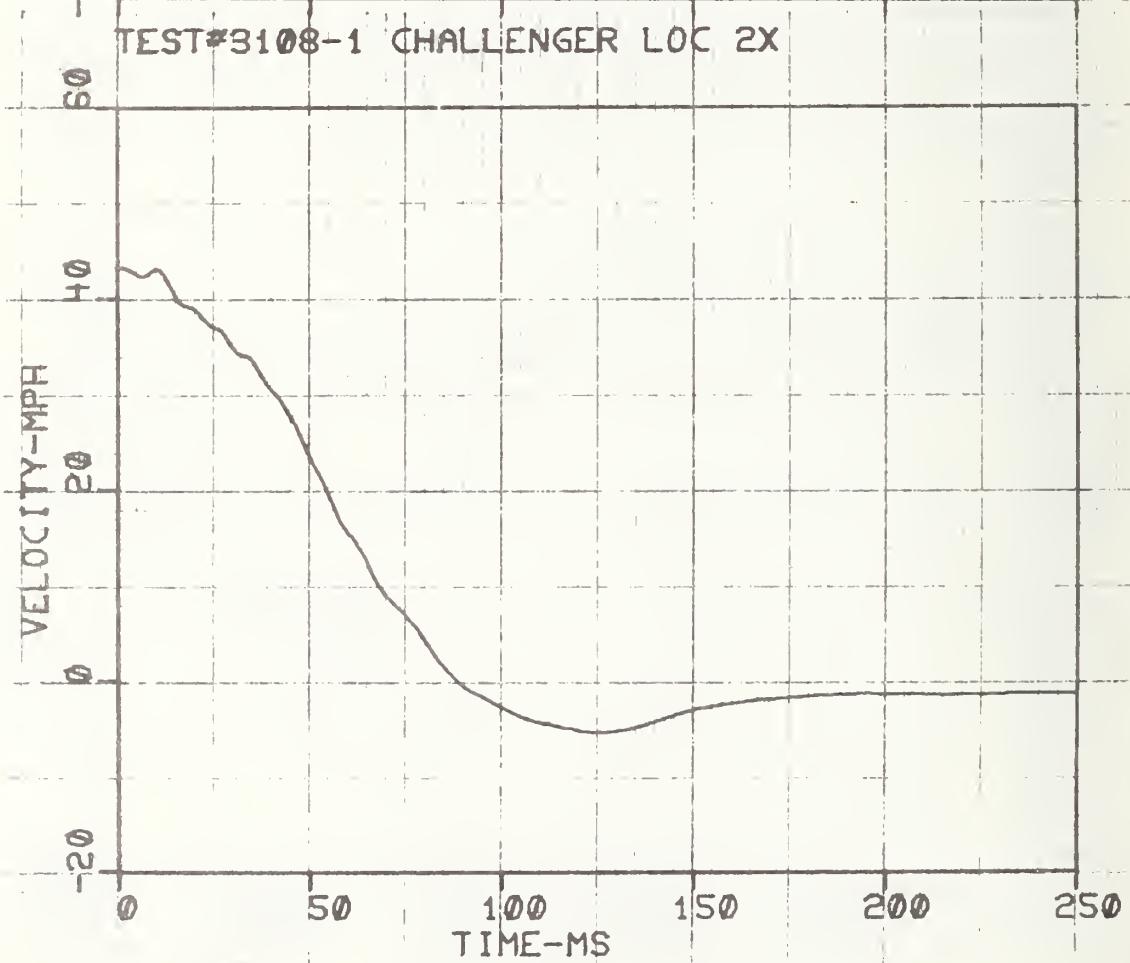
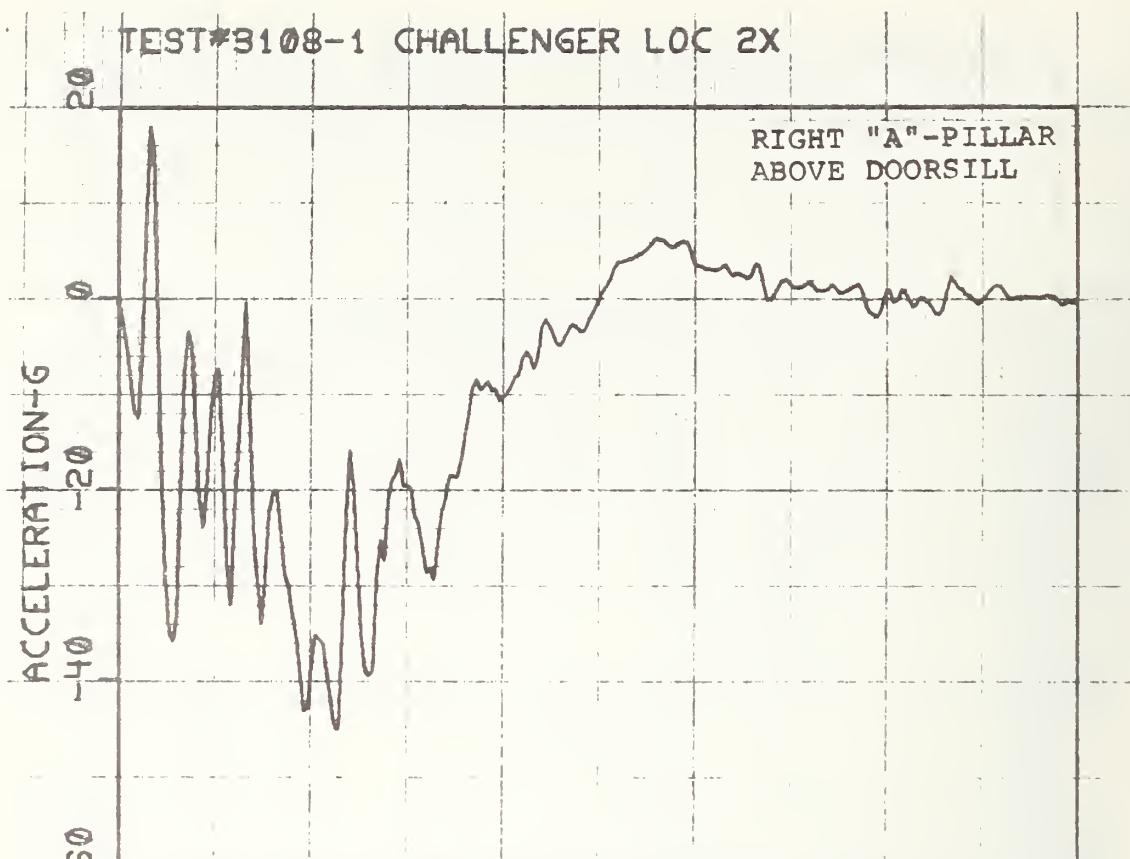


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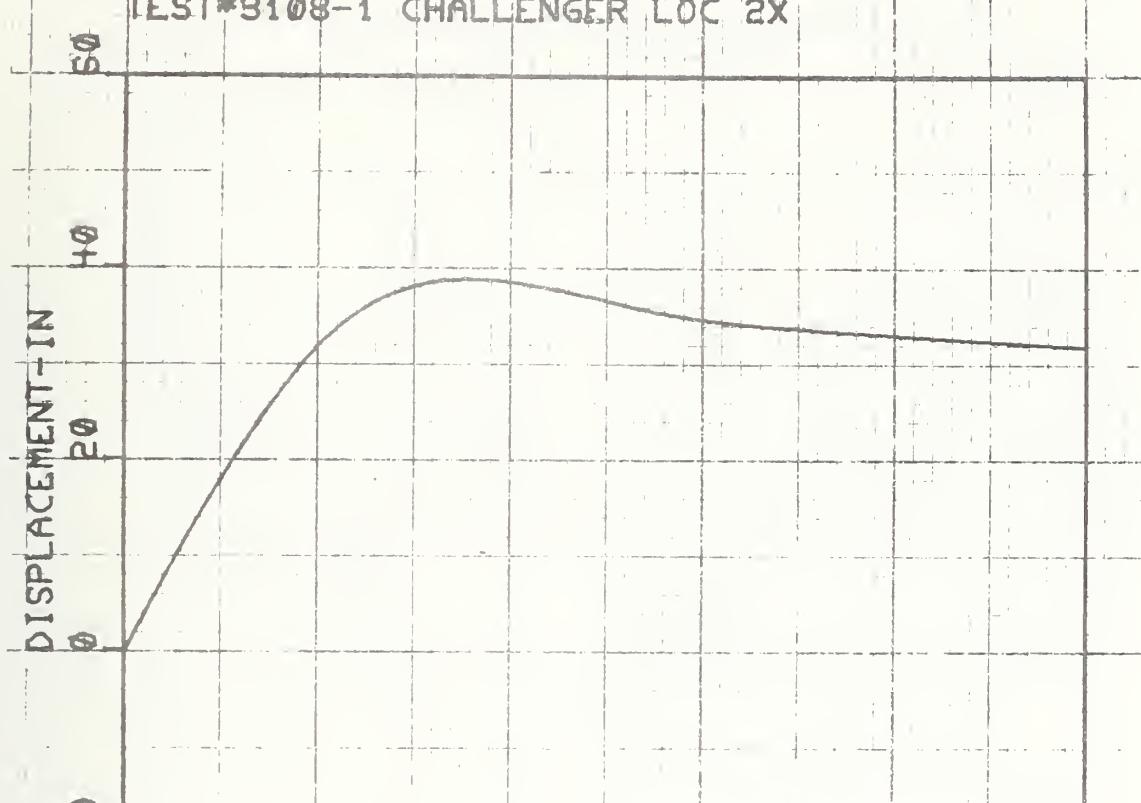


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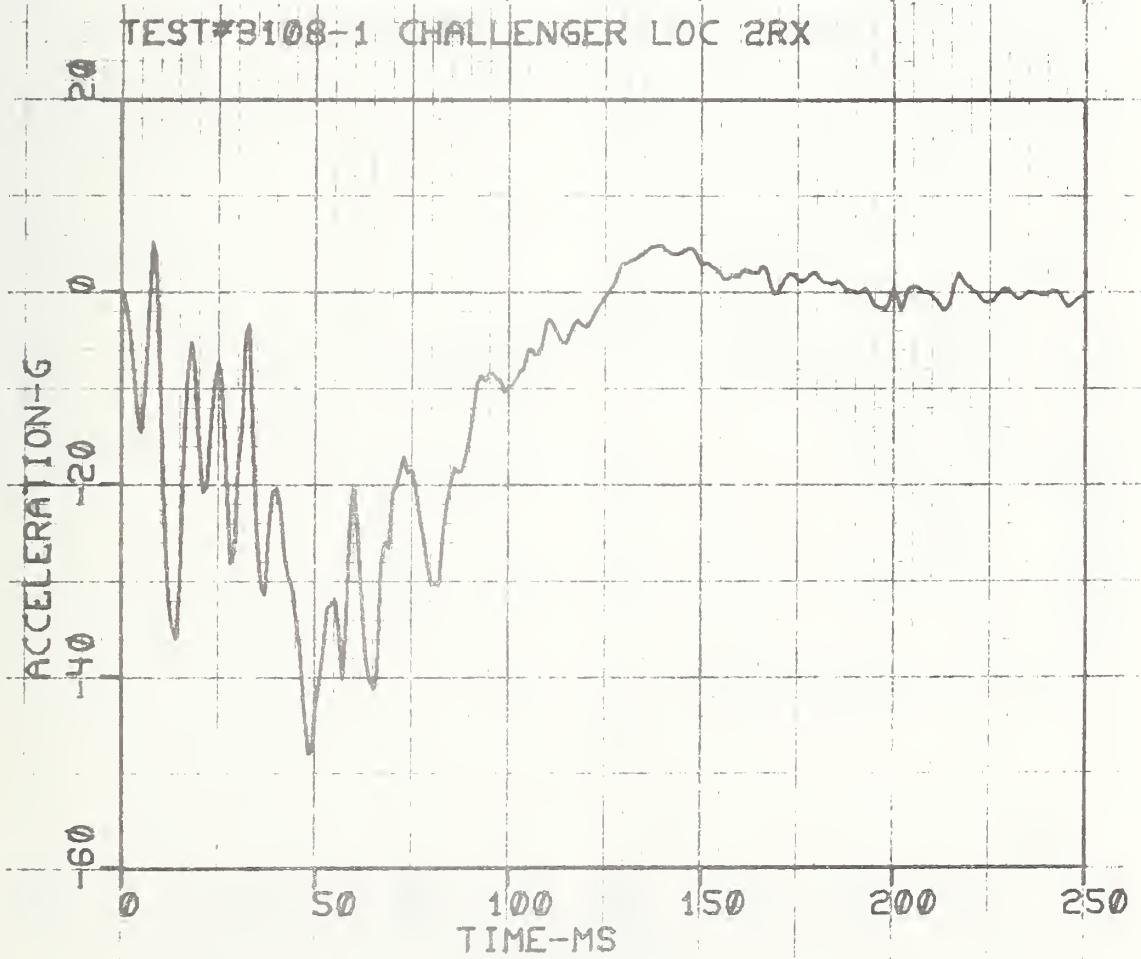


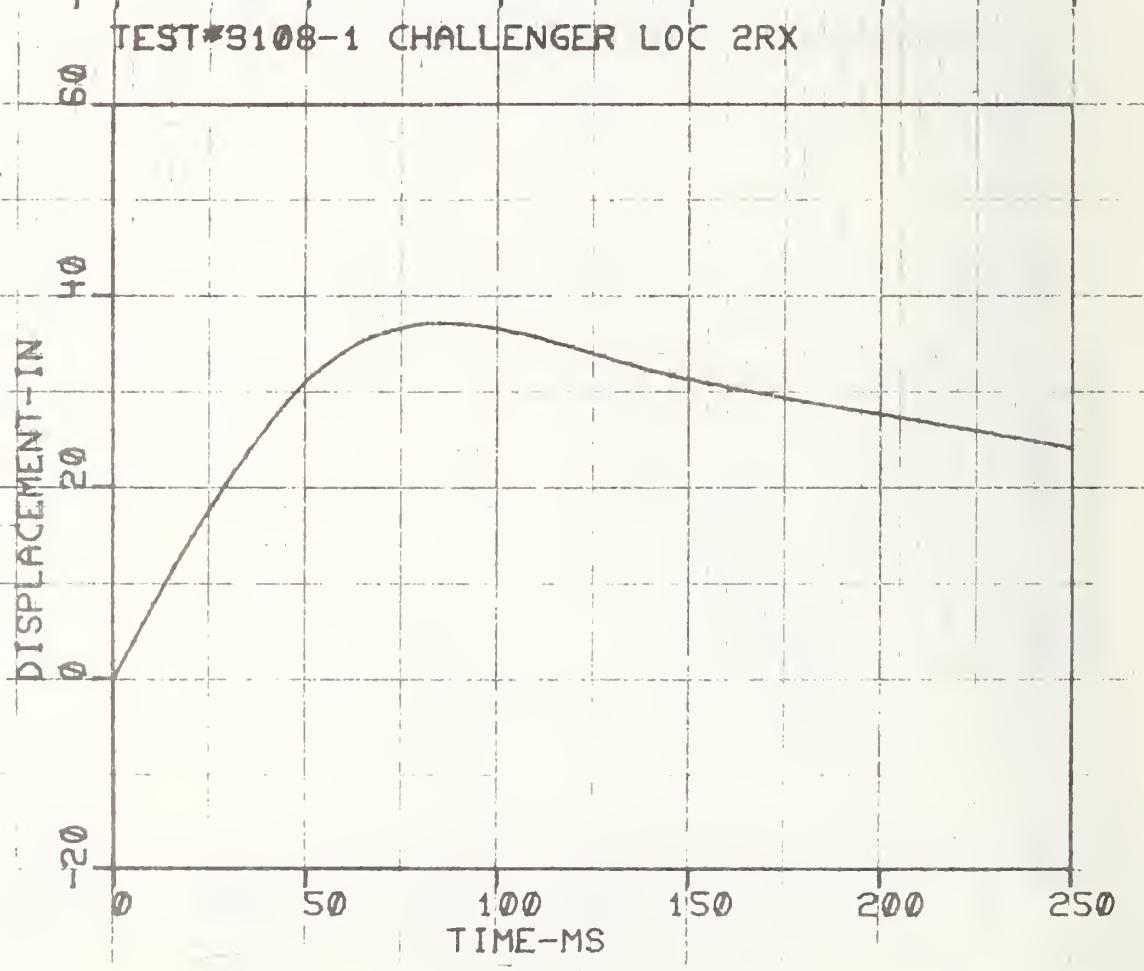
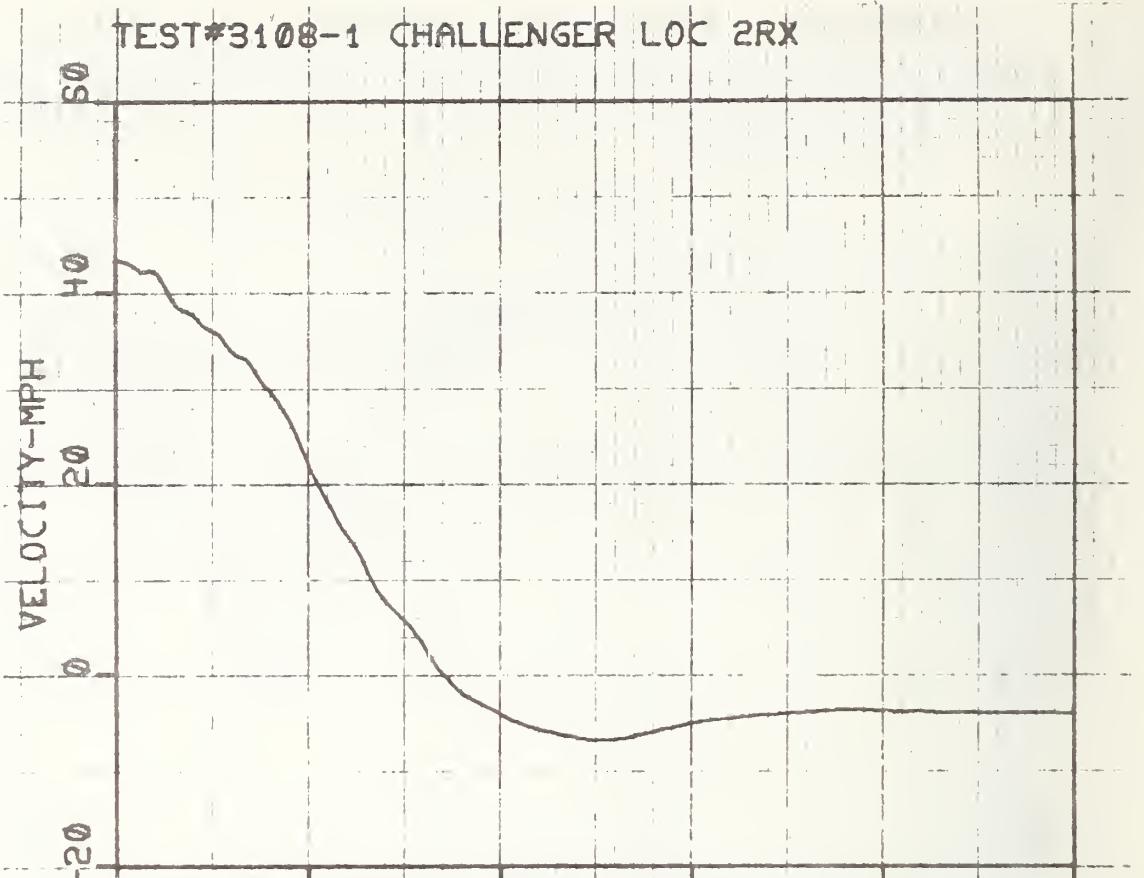


TEST#3108-1 CHALLENGER LOC 2X

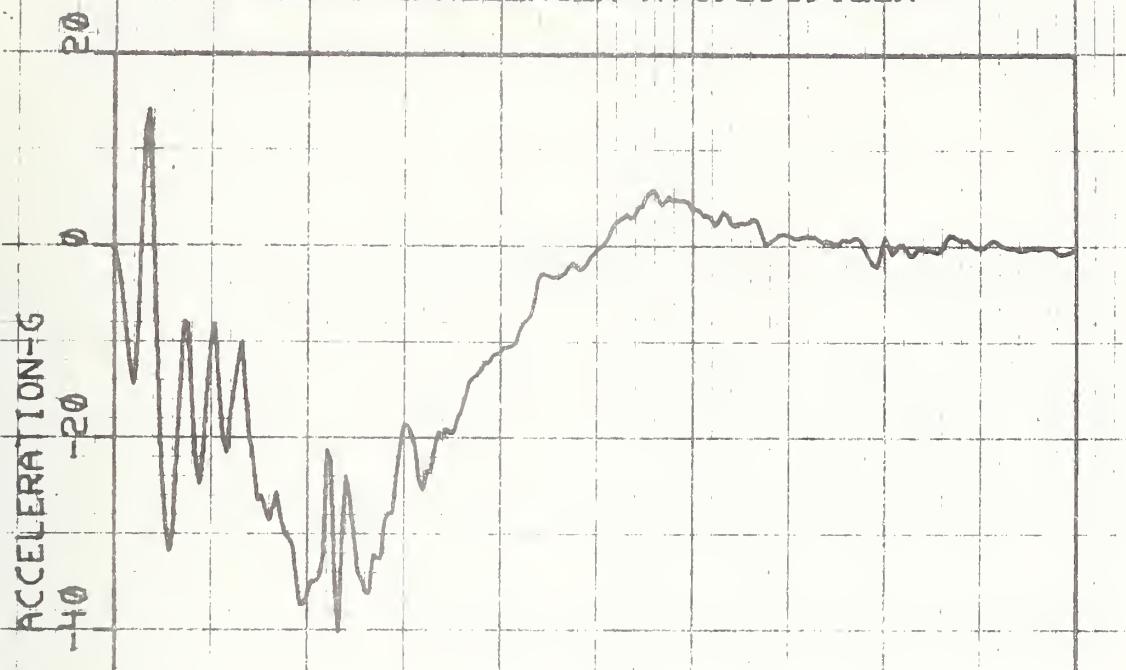


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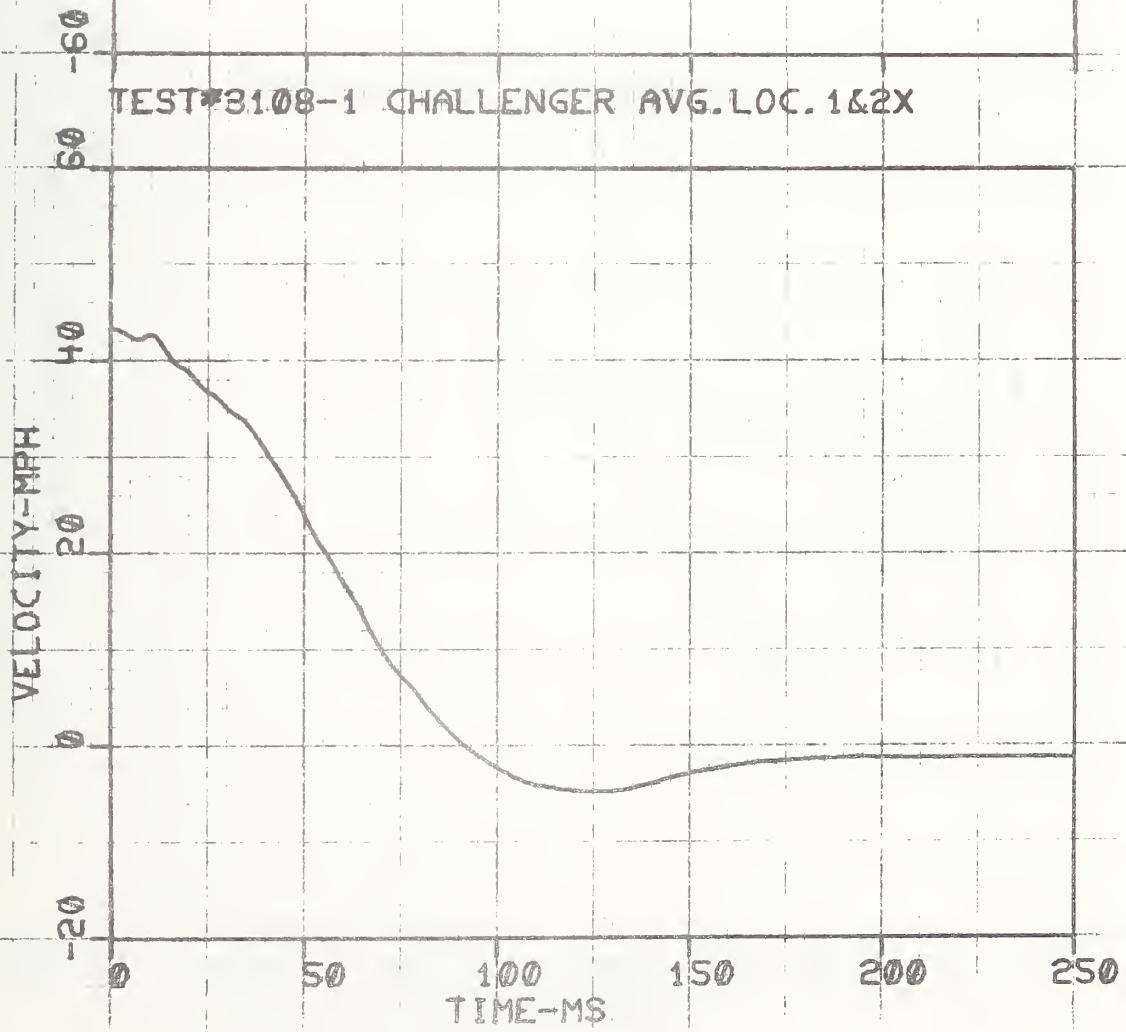




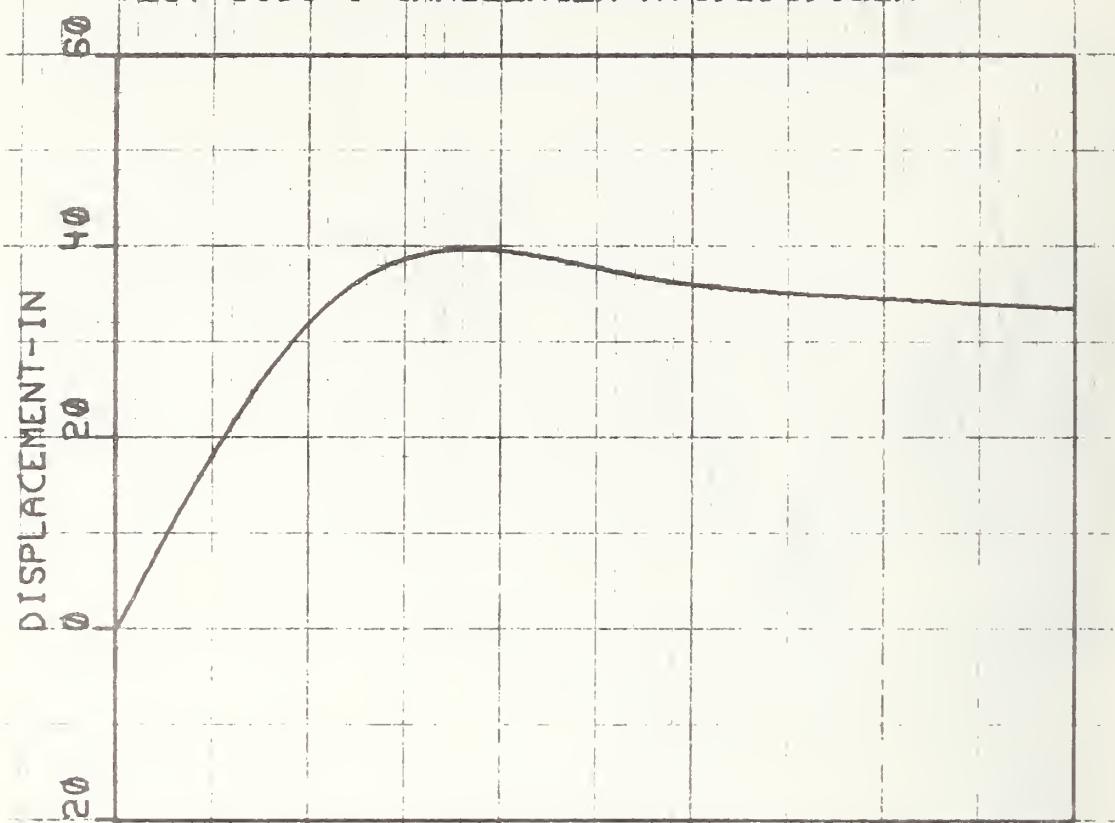
TEST#3108-1 CHALLENGER AVG.LOC. 1&2X



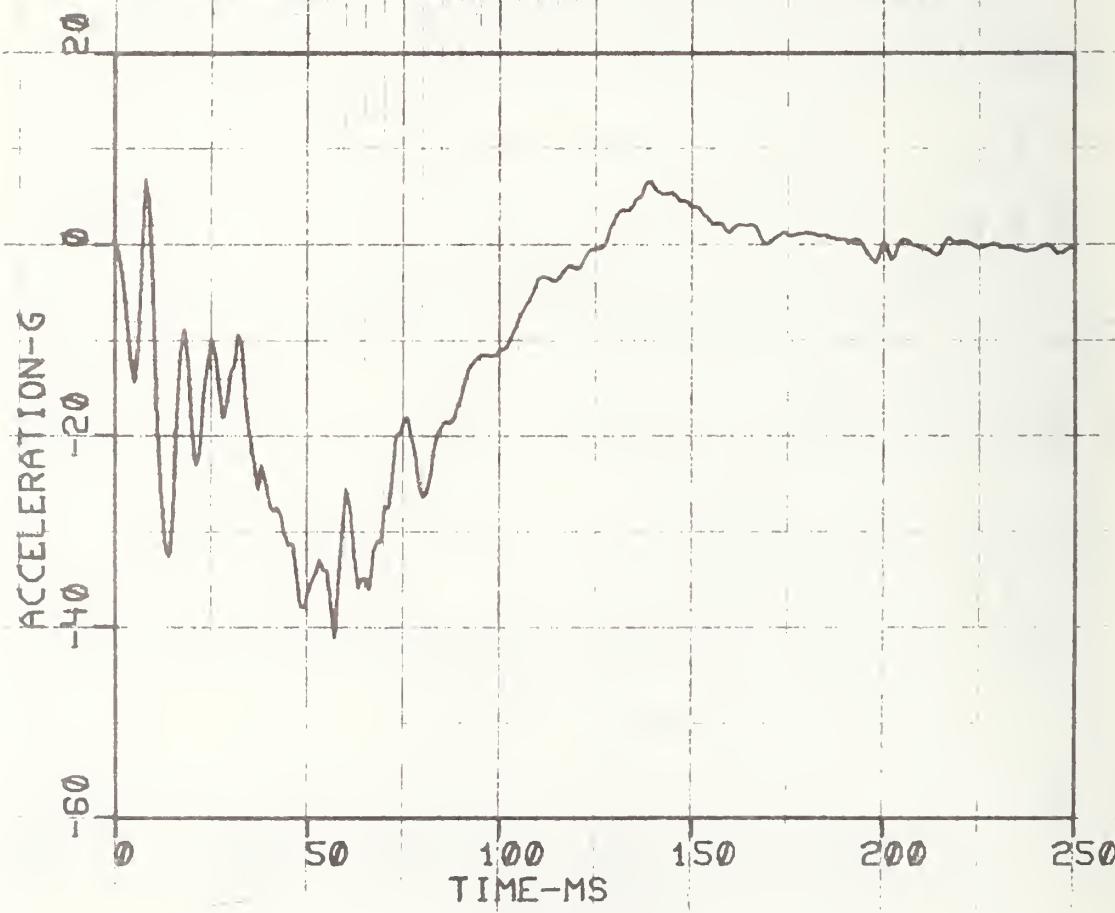
TEST#3108-1 CHALLENGER AVG.LOC. 1&2X



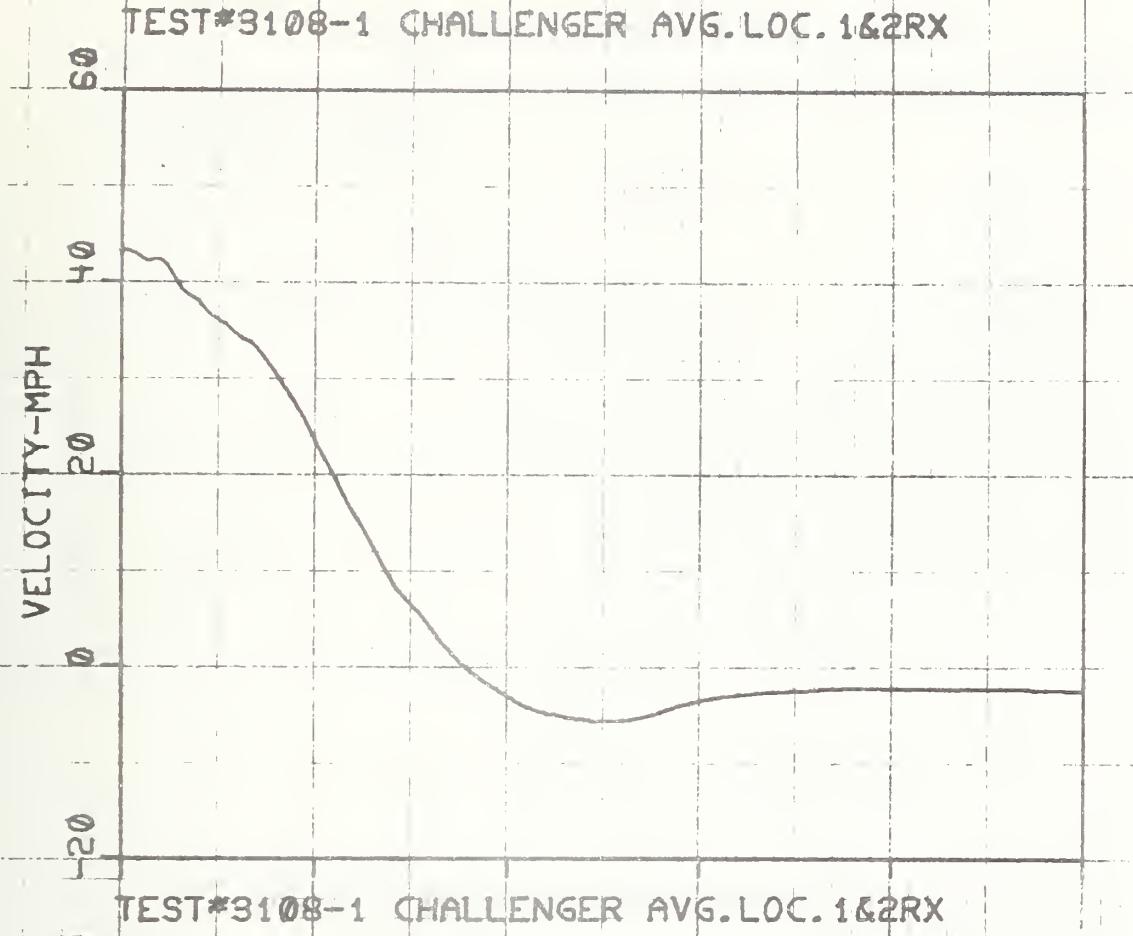
TEST#3108-1 CHALLENGER AVG. LOC. 1&2X



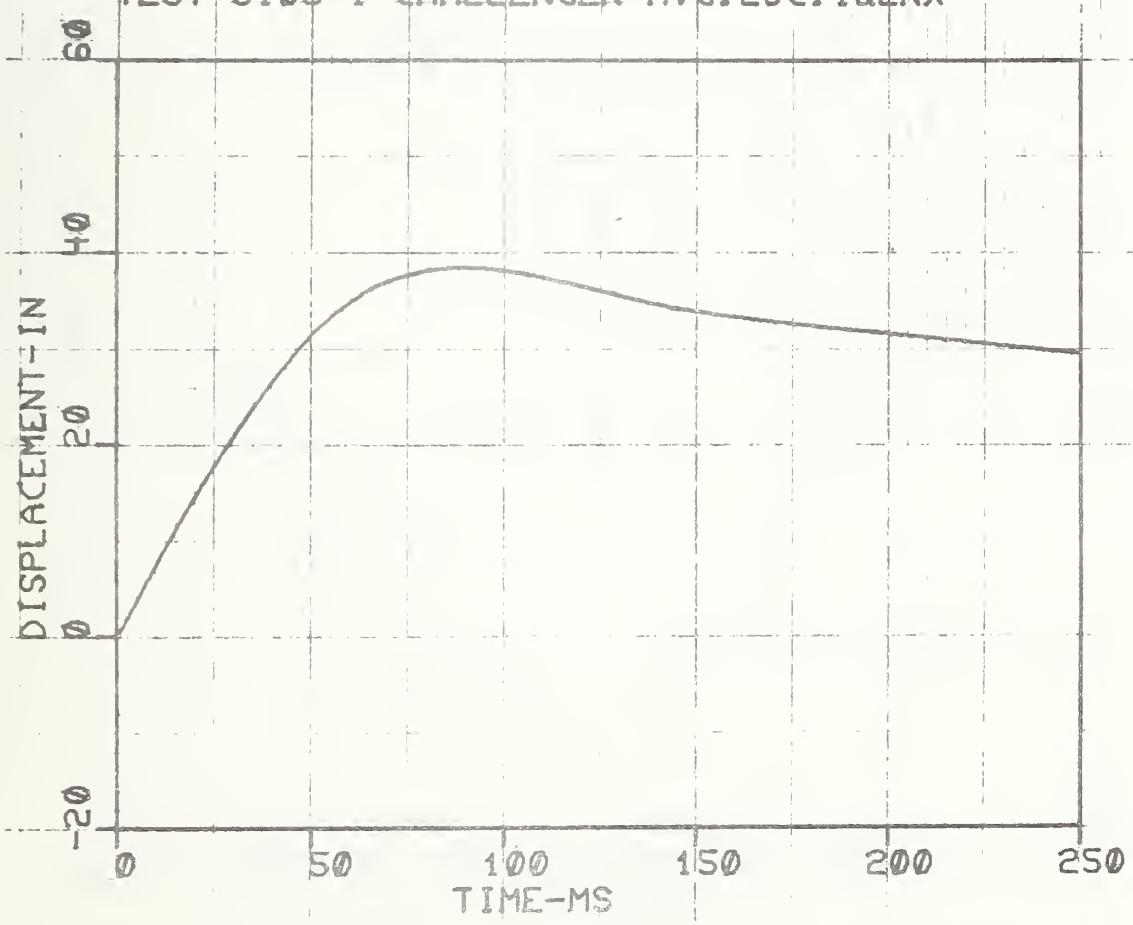
TEST#3108-1 CHALLENGER AVG. LOC. 1&2RX



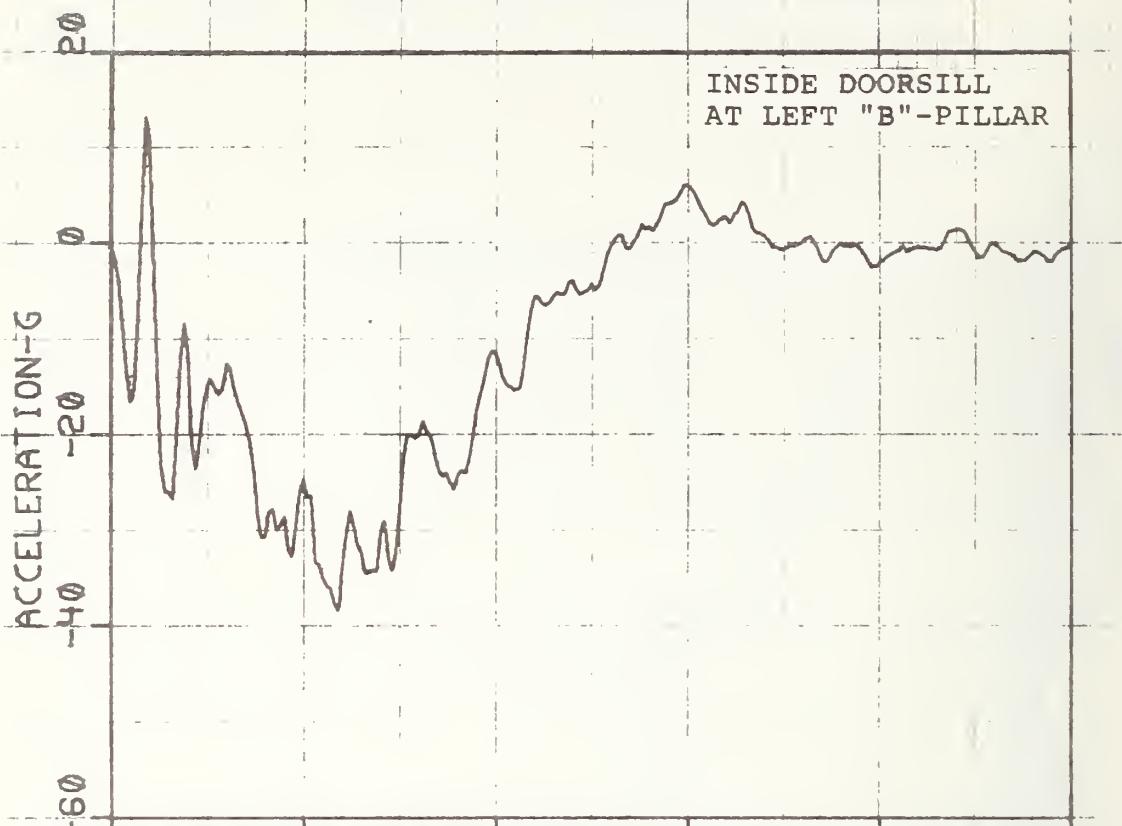
TEST#3108-1 CHALLENGER AVG.LOC. 1&2RX



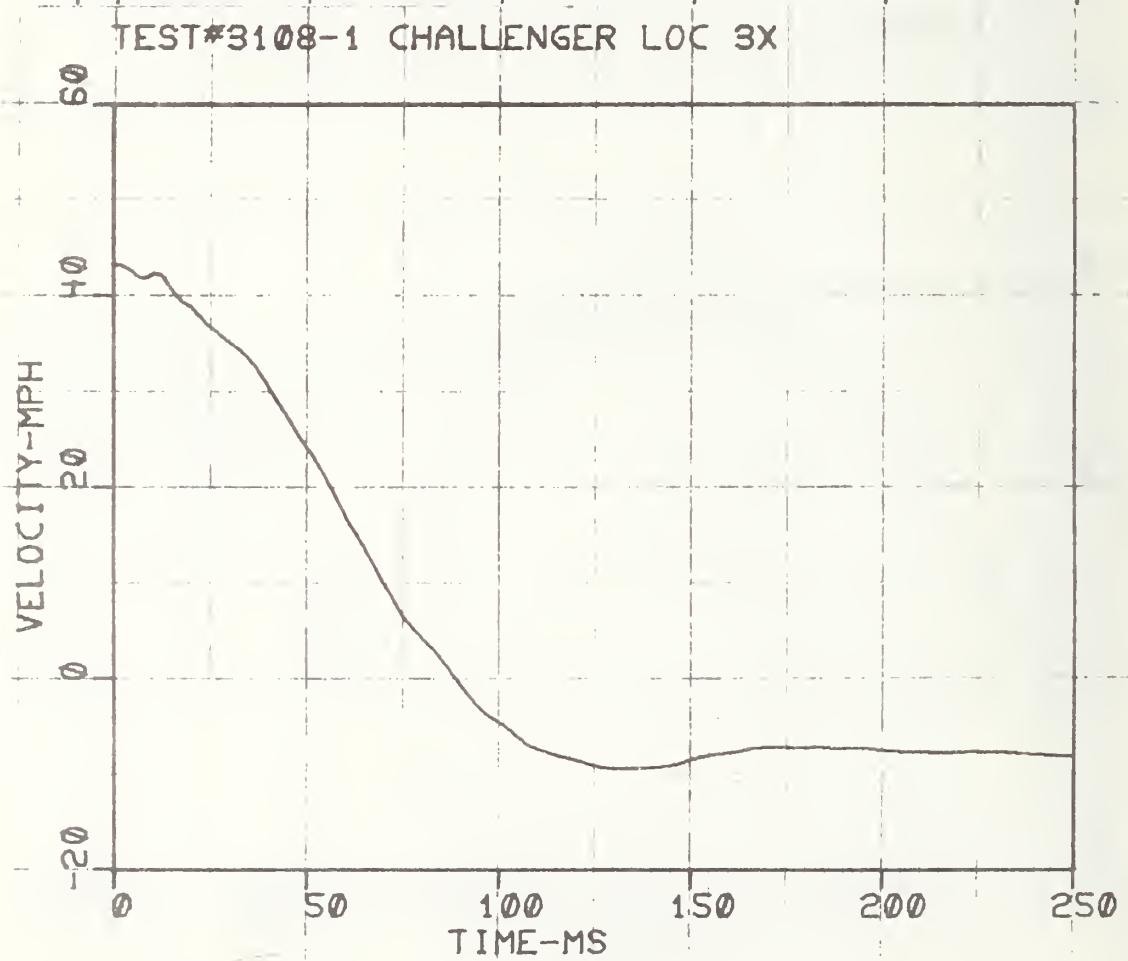
TEST#3108-1 CHALLENGER AVG.LOC. 1&2RX



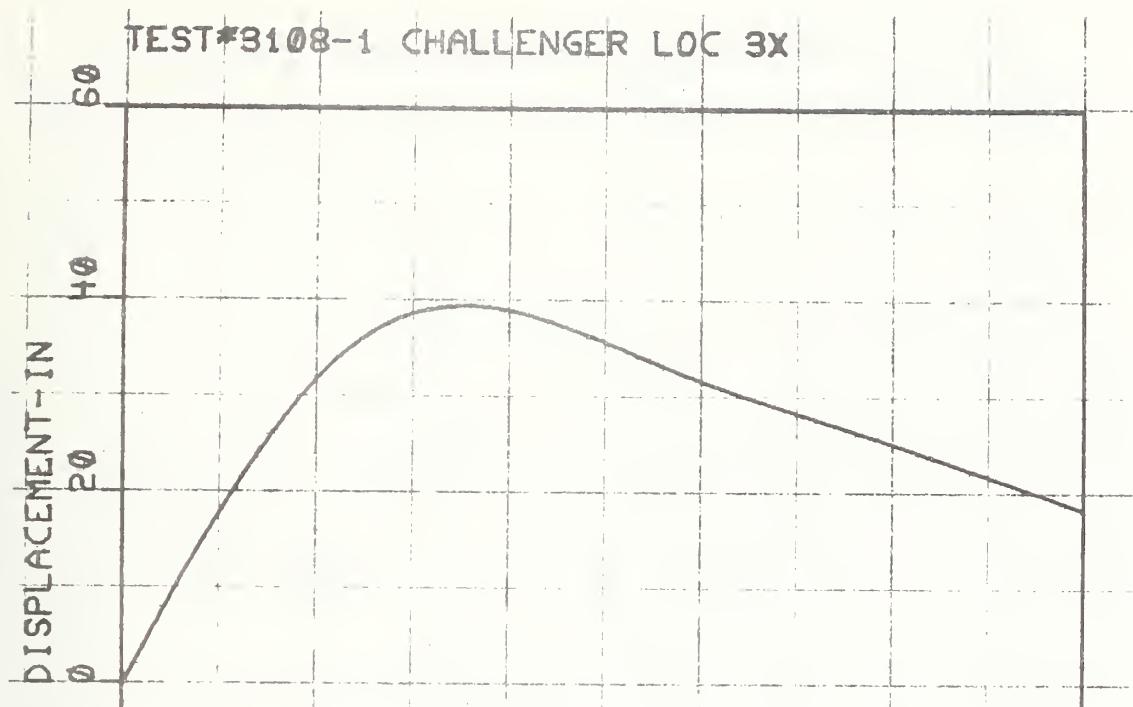
TEST#3108-1 CHALLENGER LOC 3X



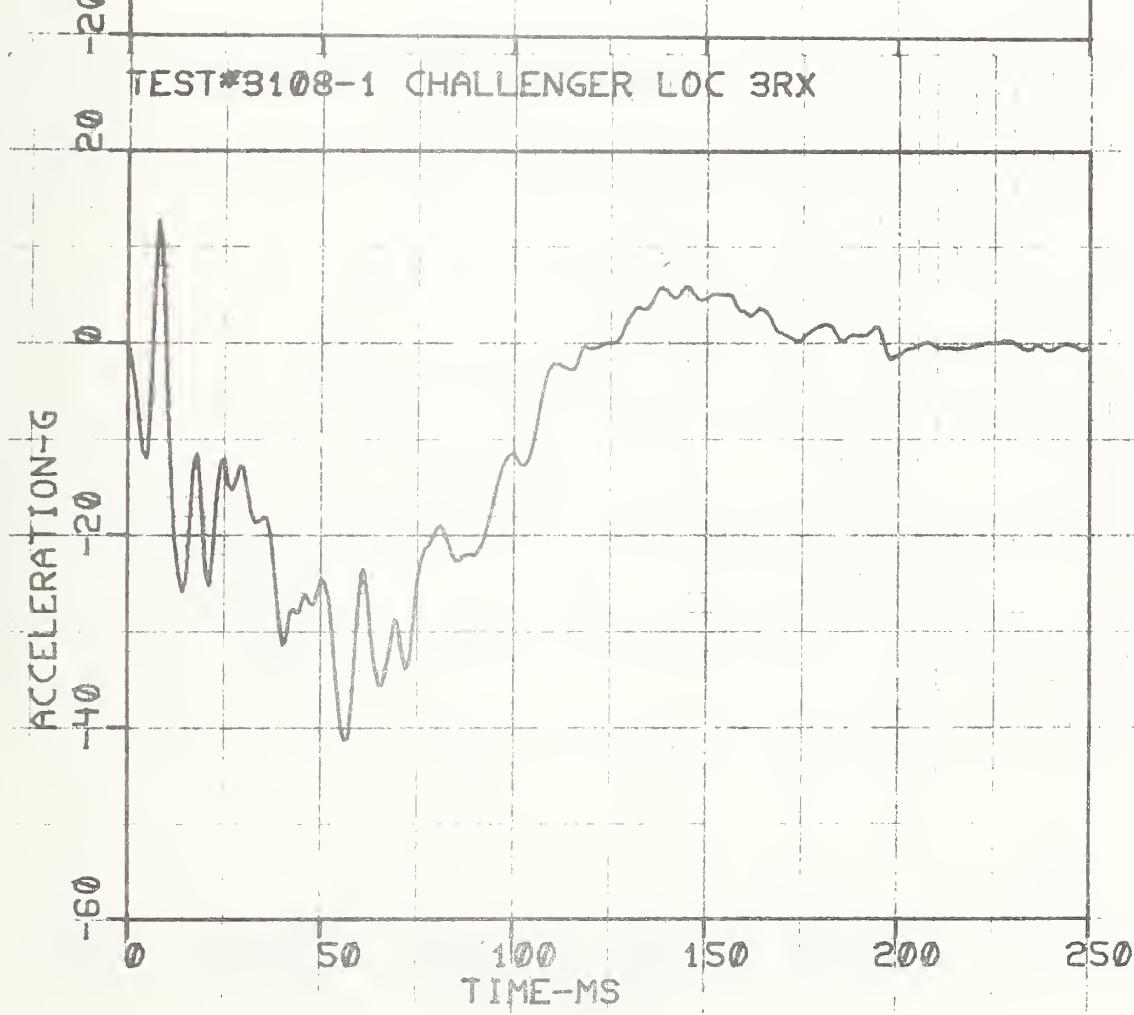
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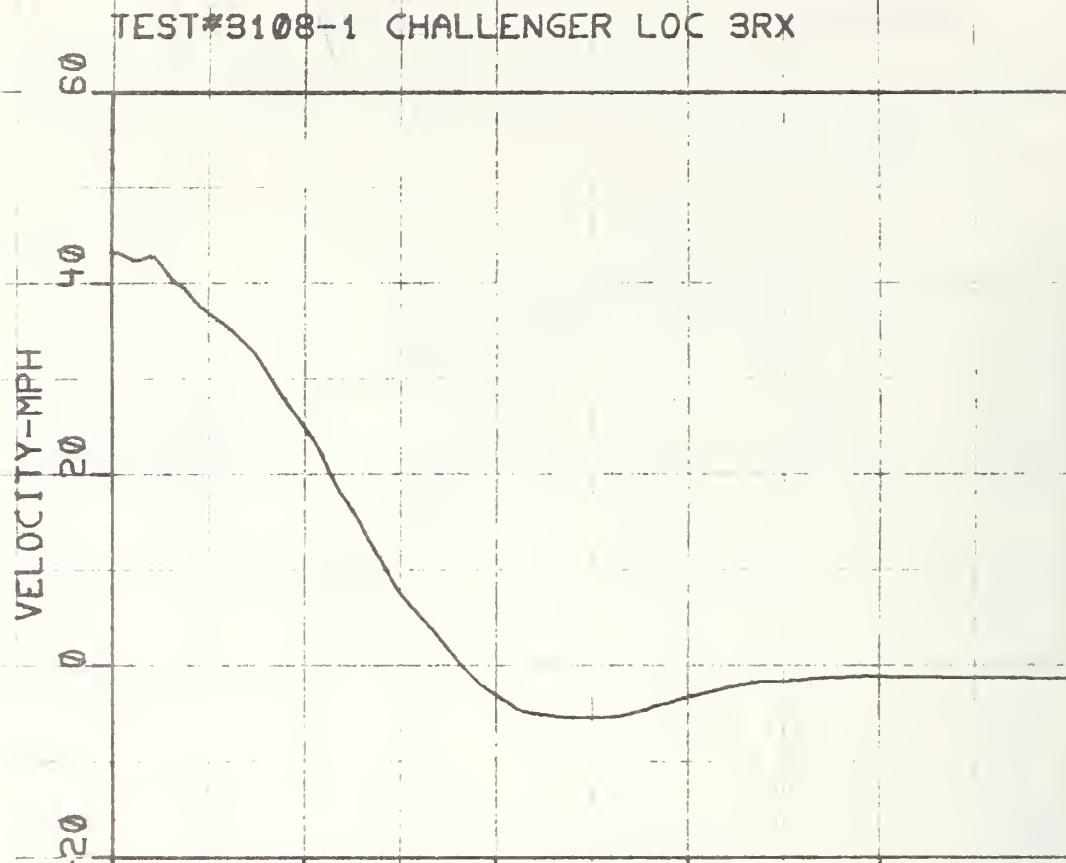
TEST#3108-1 CHALLENGER LOC 3X



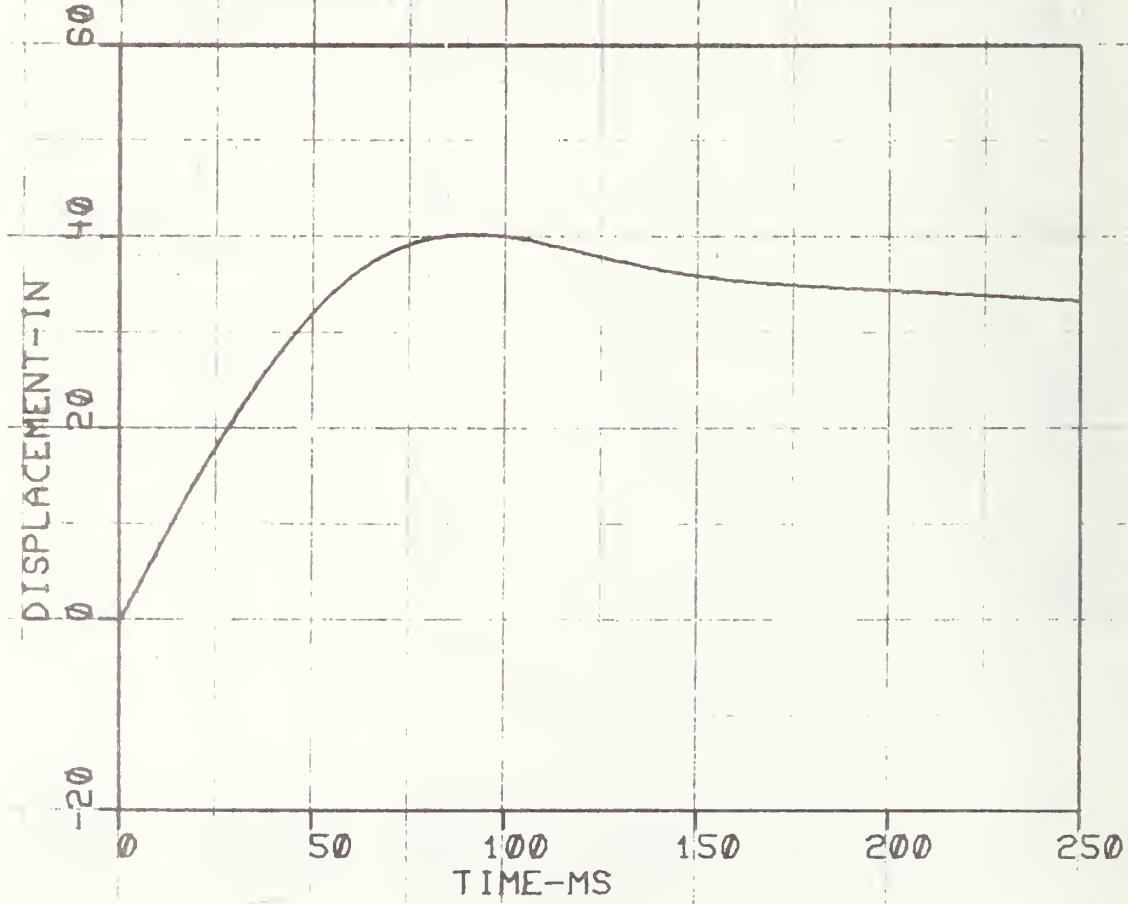
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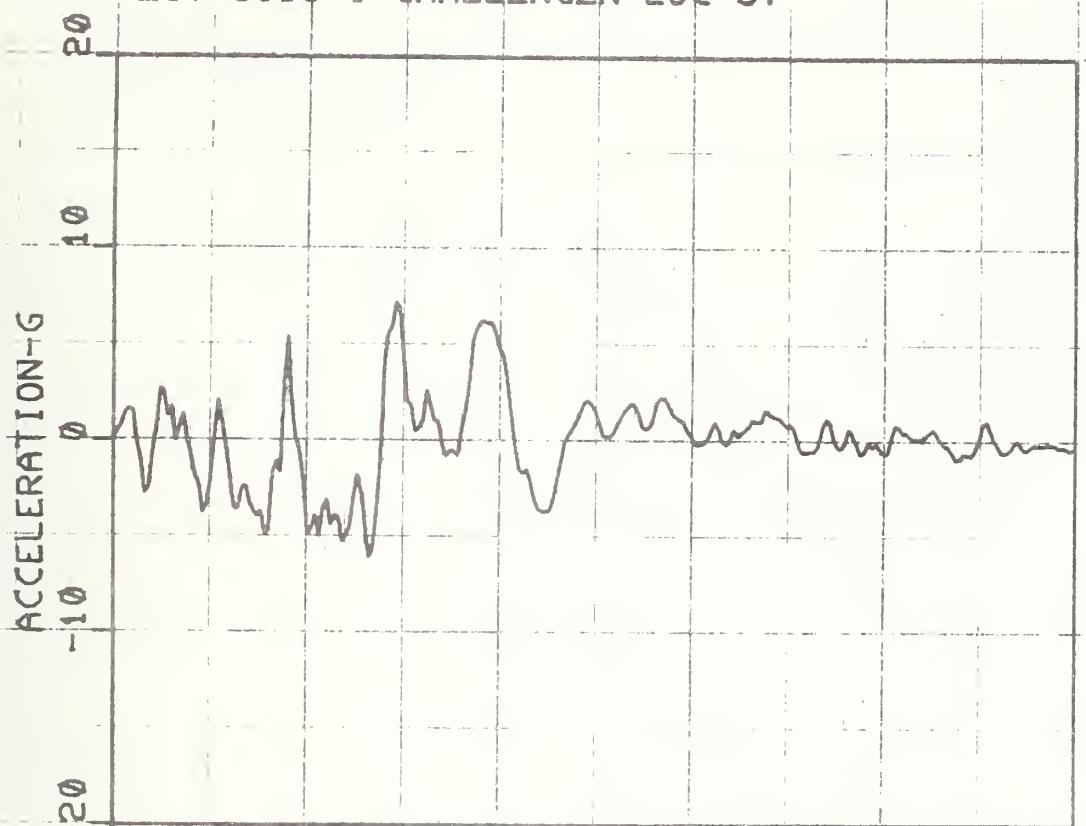
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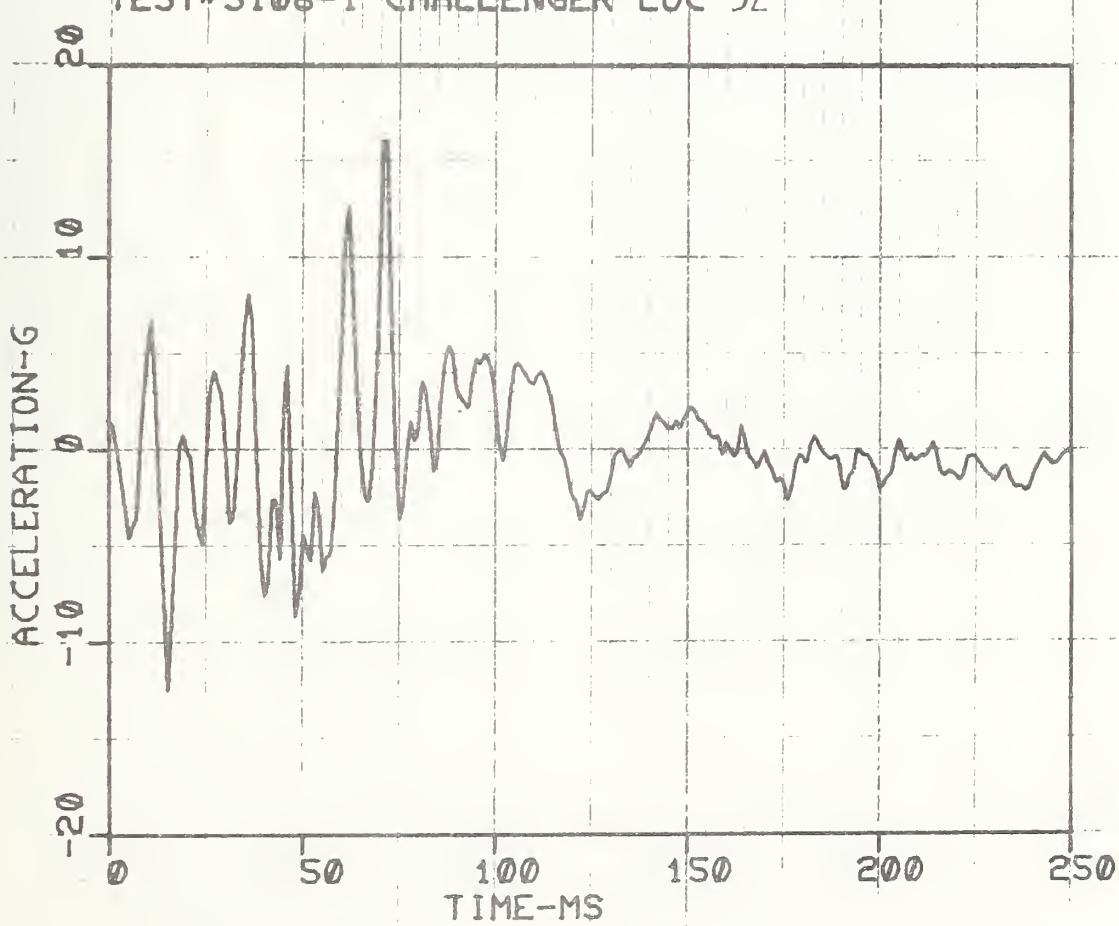
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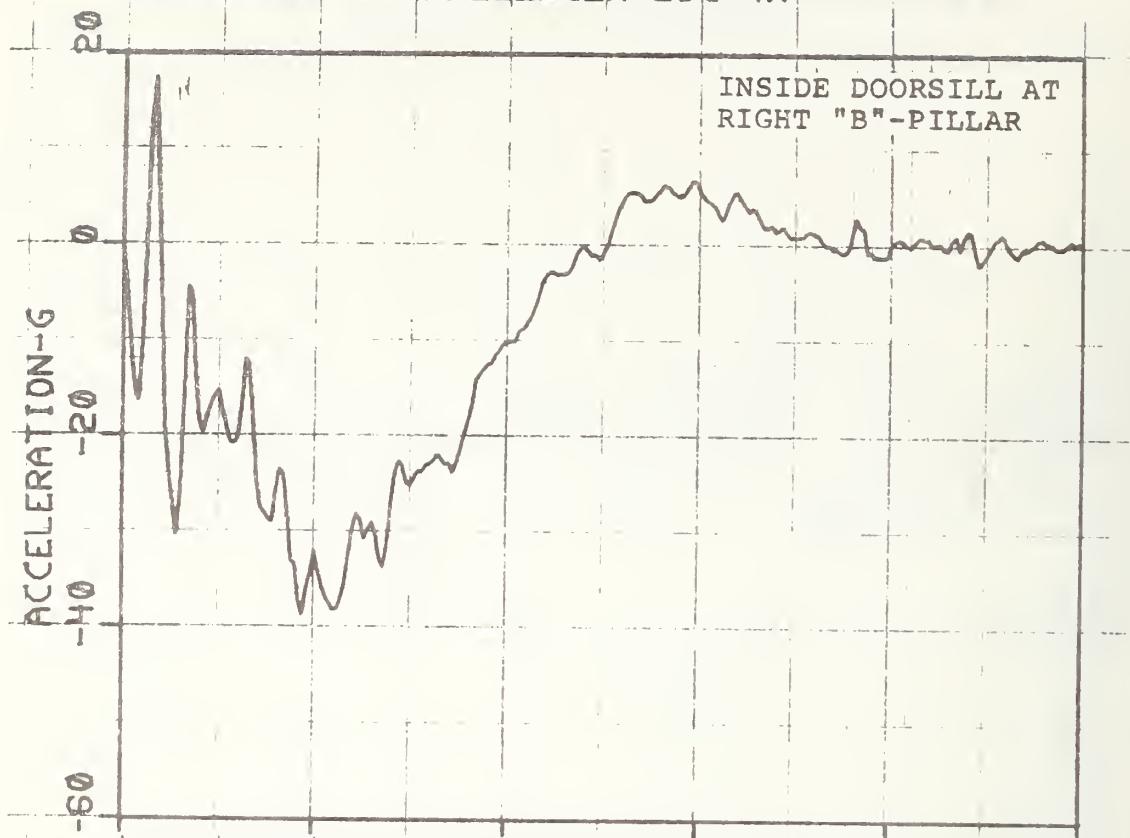
TEST#3108-1 CHALLENGER LOC 3Y



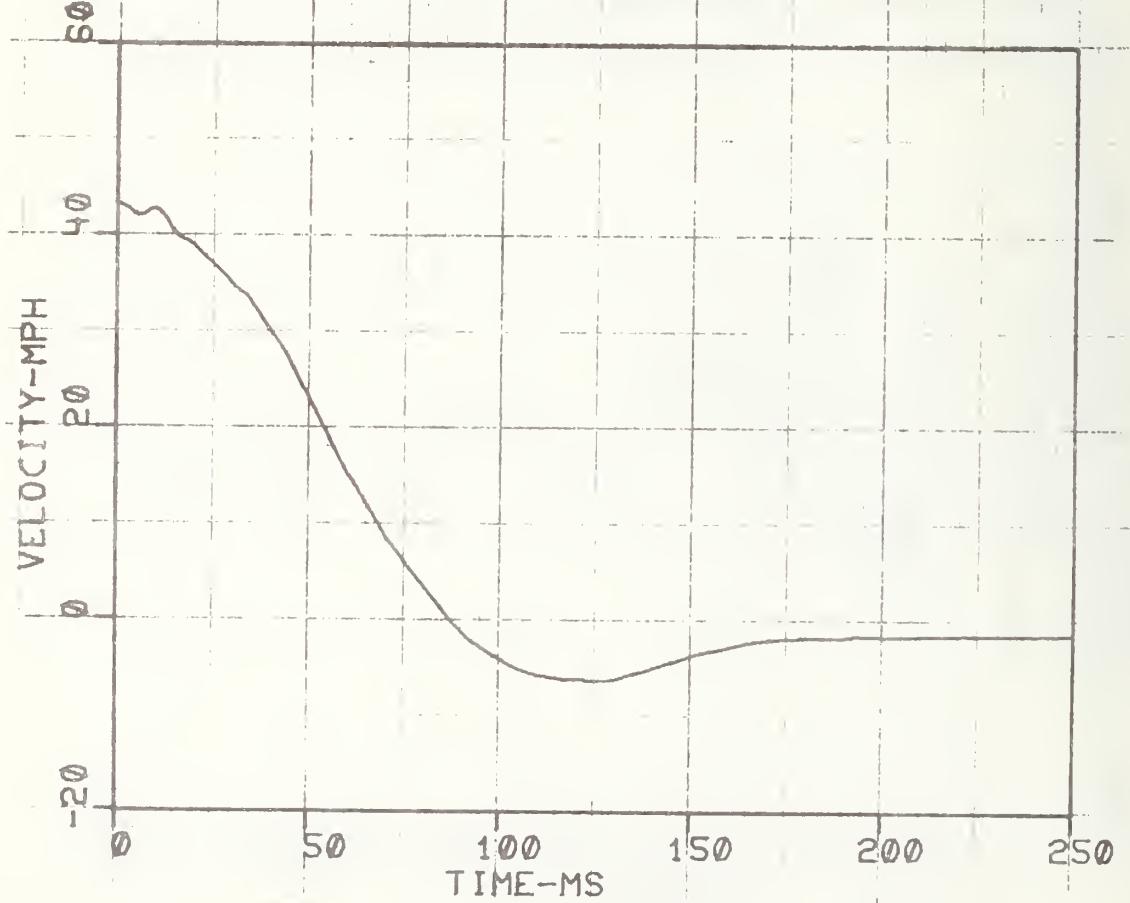
TEST#3108-1 CHALLENGER LOC 3Z



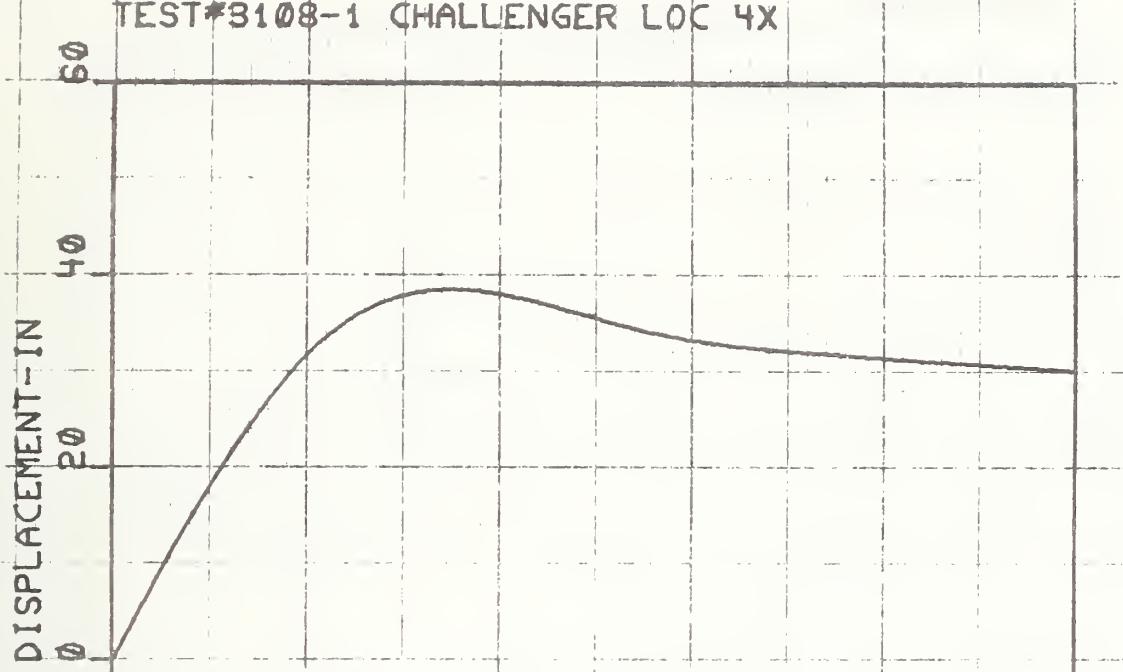
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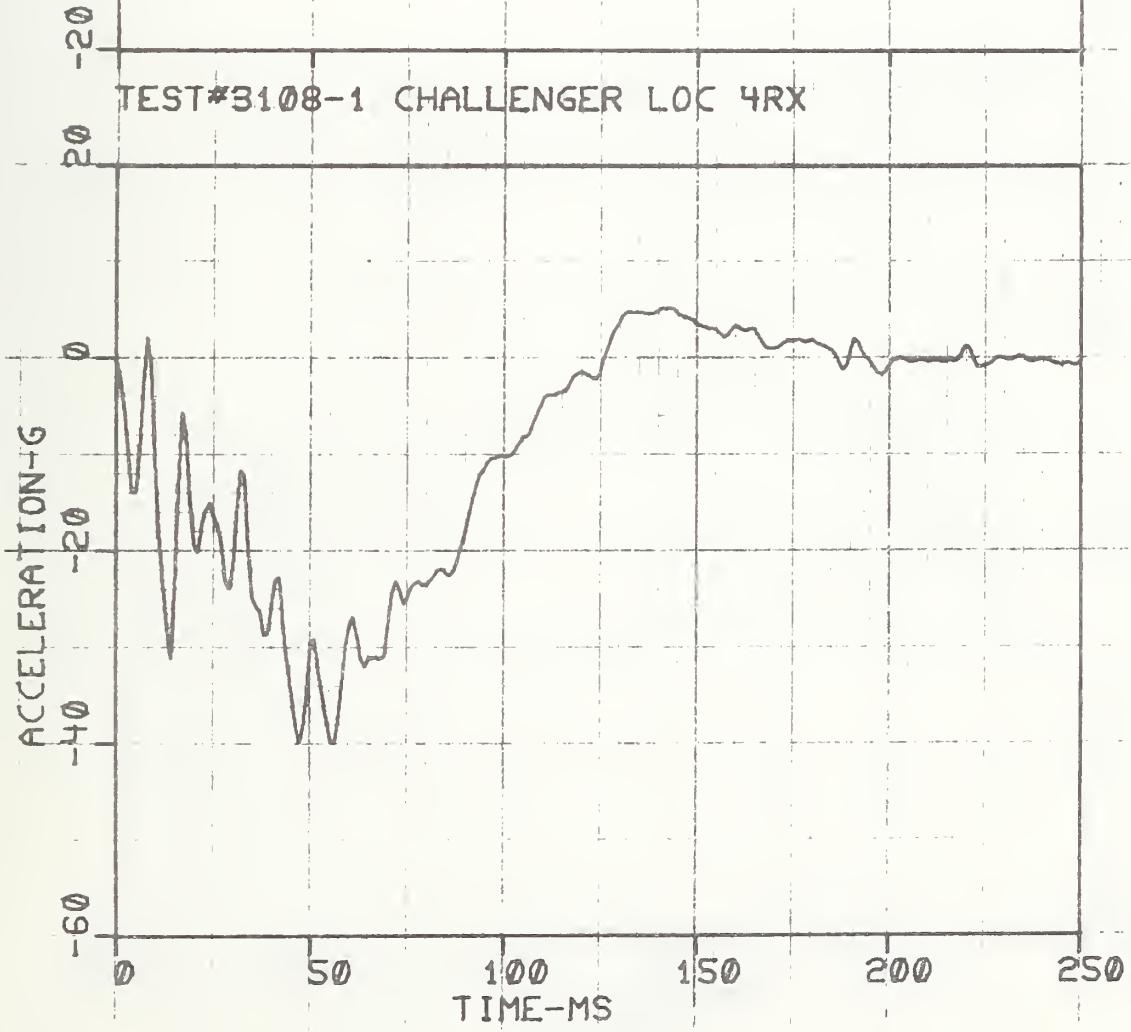
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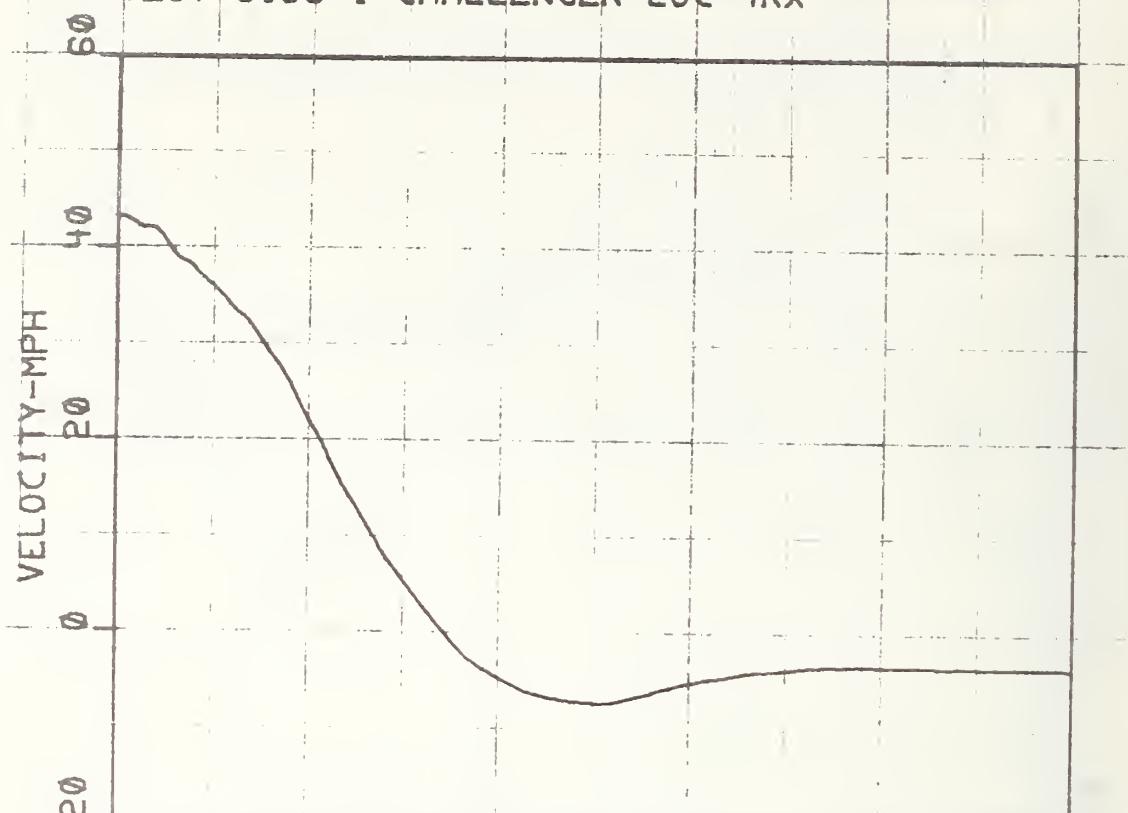
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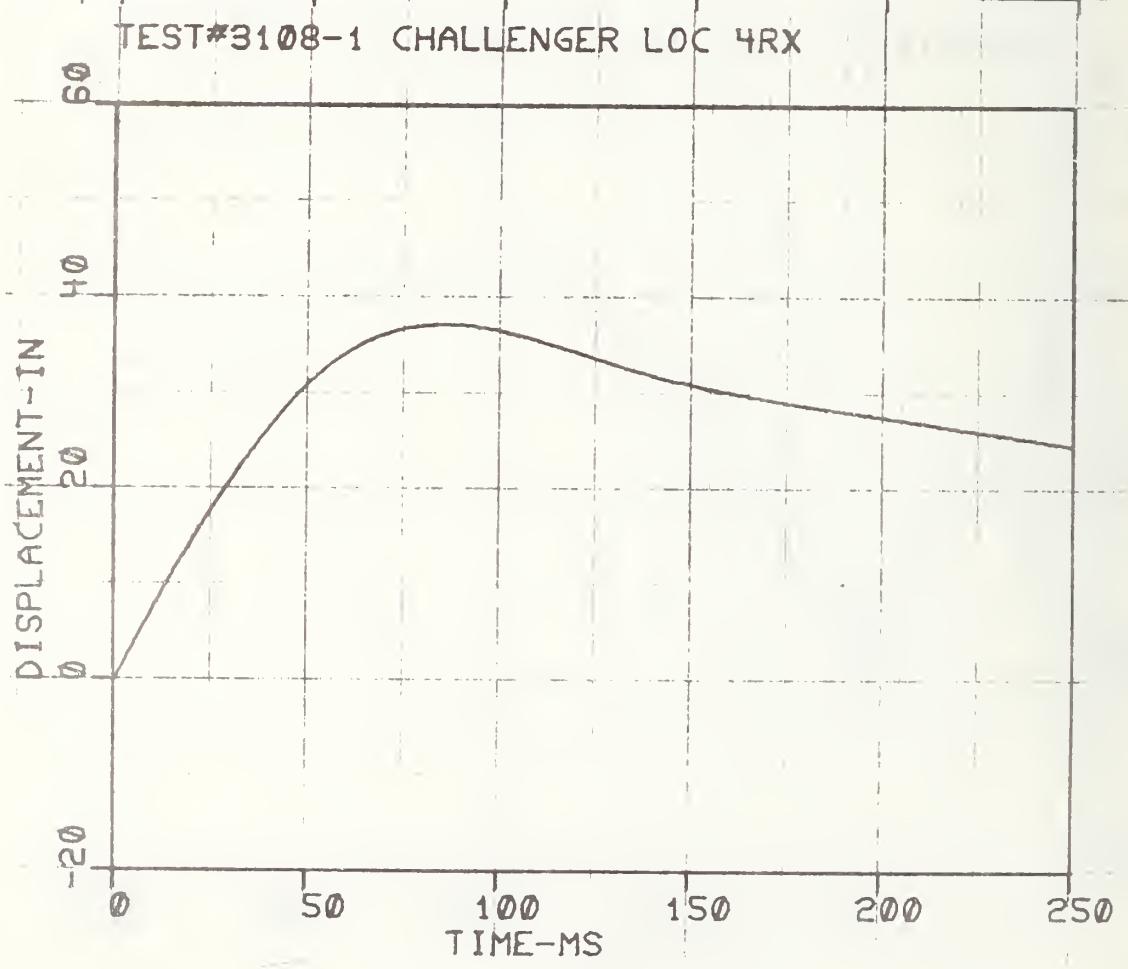
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TEST#3108-1 CHALLENGER LOC 4RX

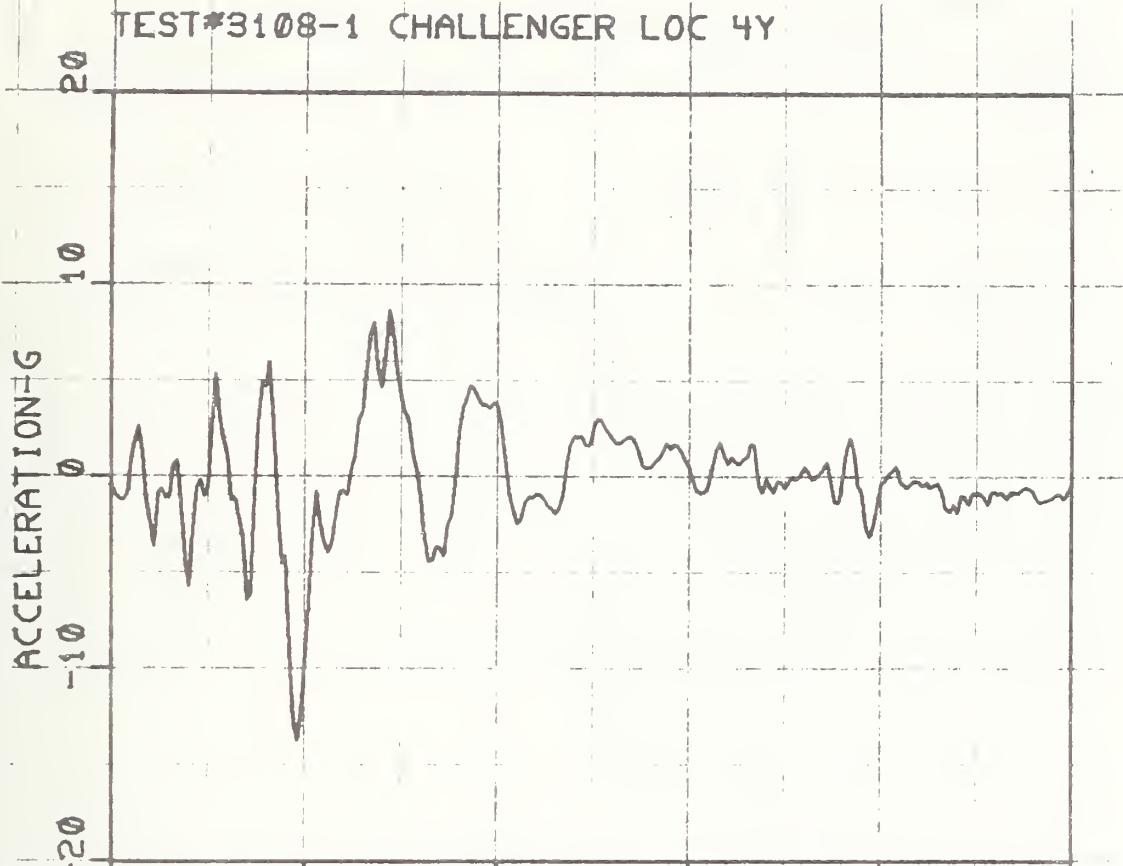


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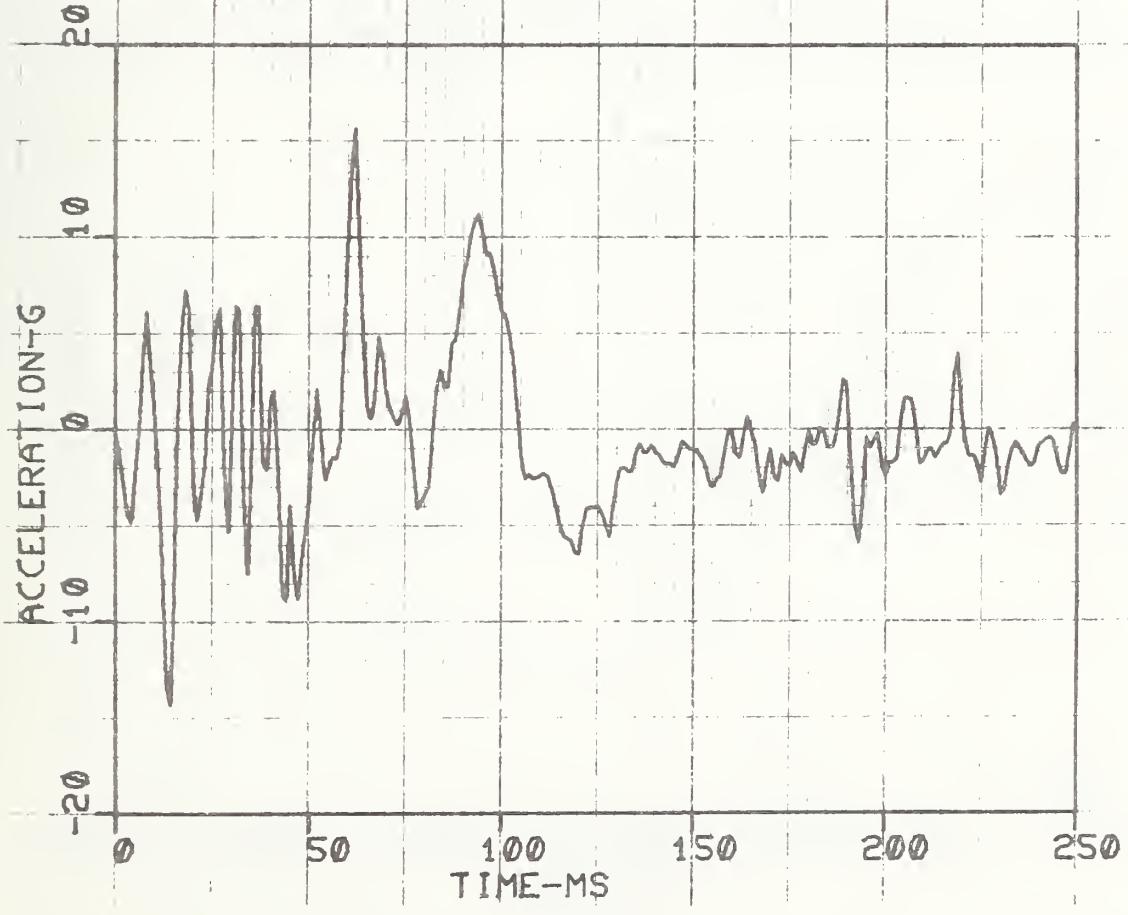


B-40

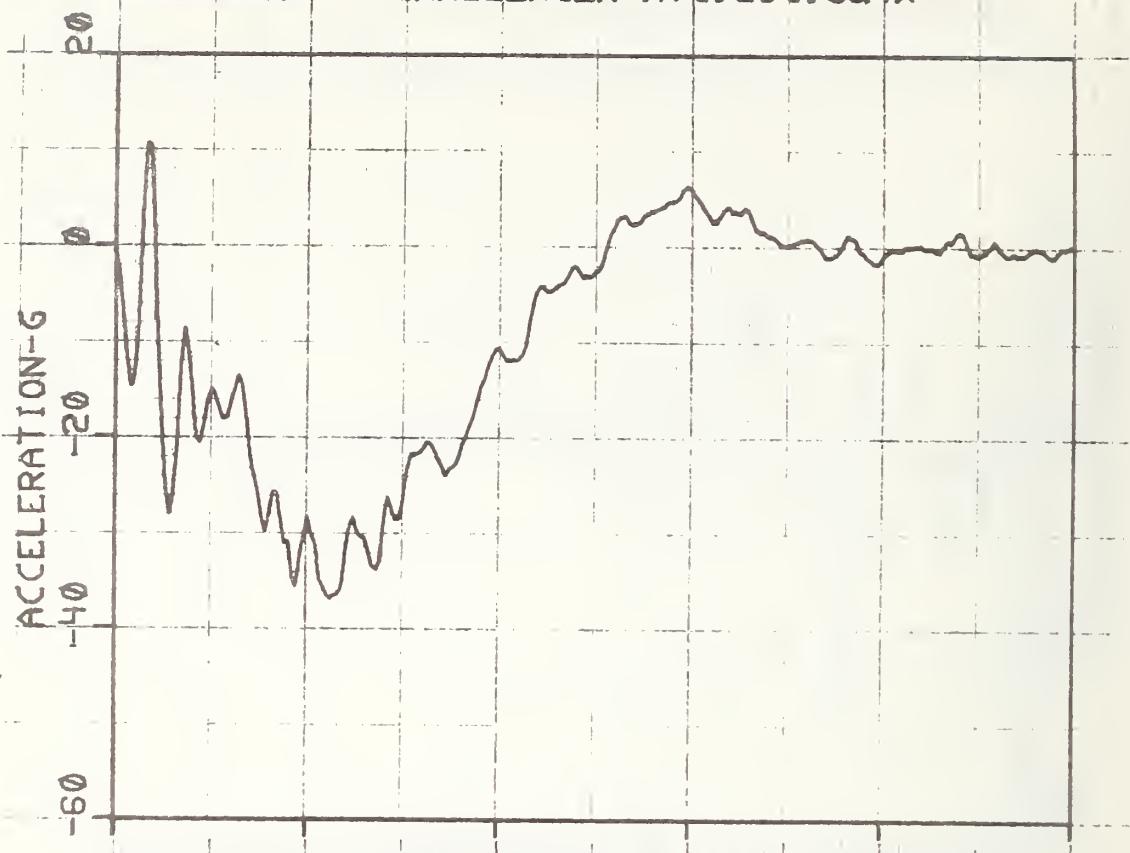
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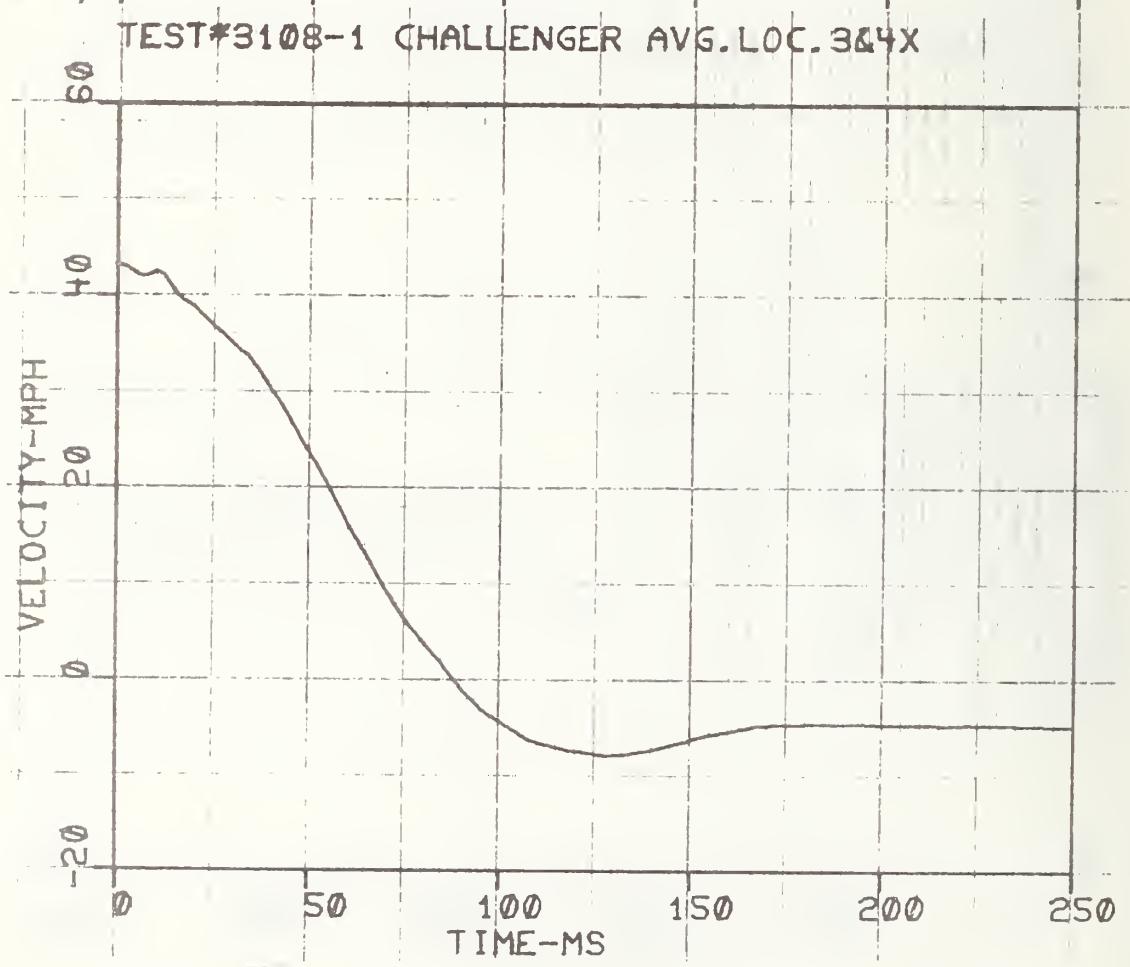
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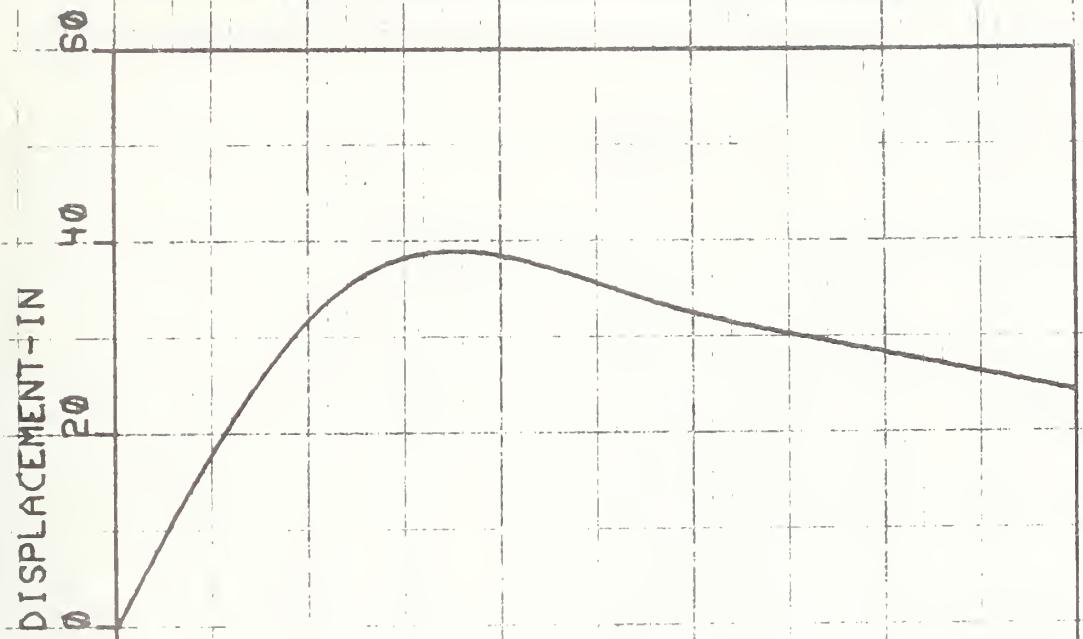
TEST#3108-1 CHALLENGER AVG.LOC. 3&4X



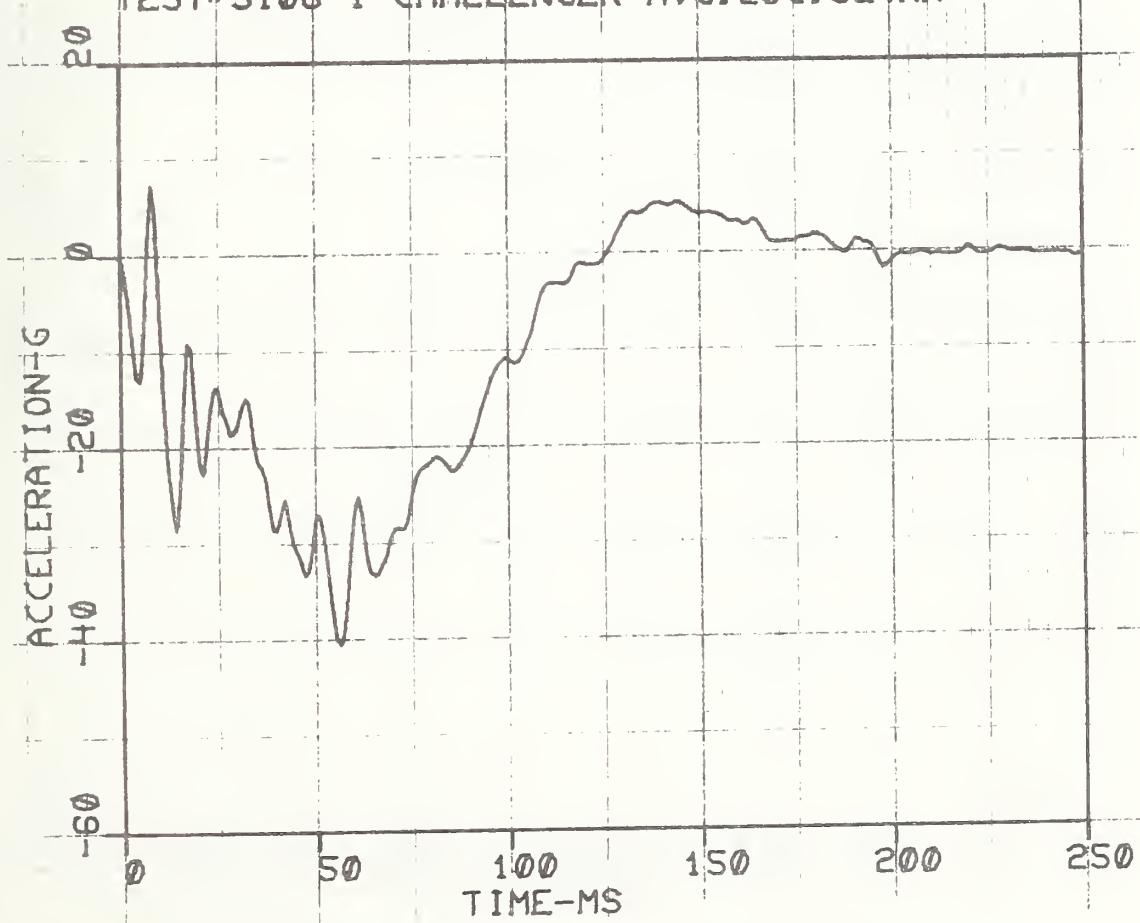
TEST#3108-1 CHALLENGER AVG.LOC. 3&4X



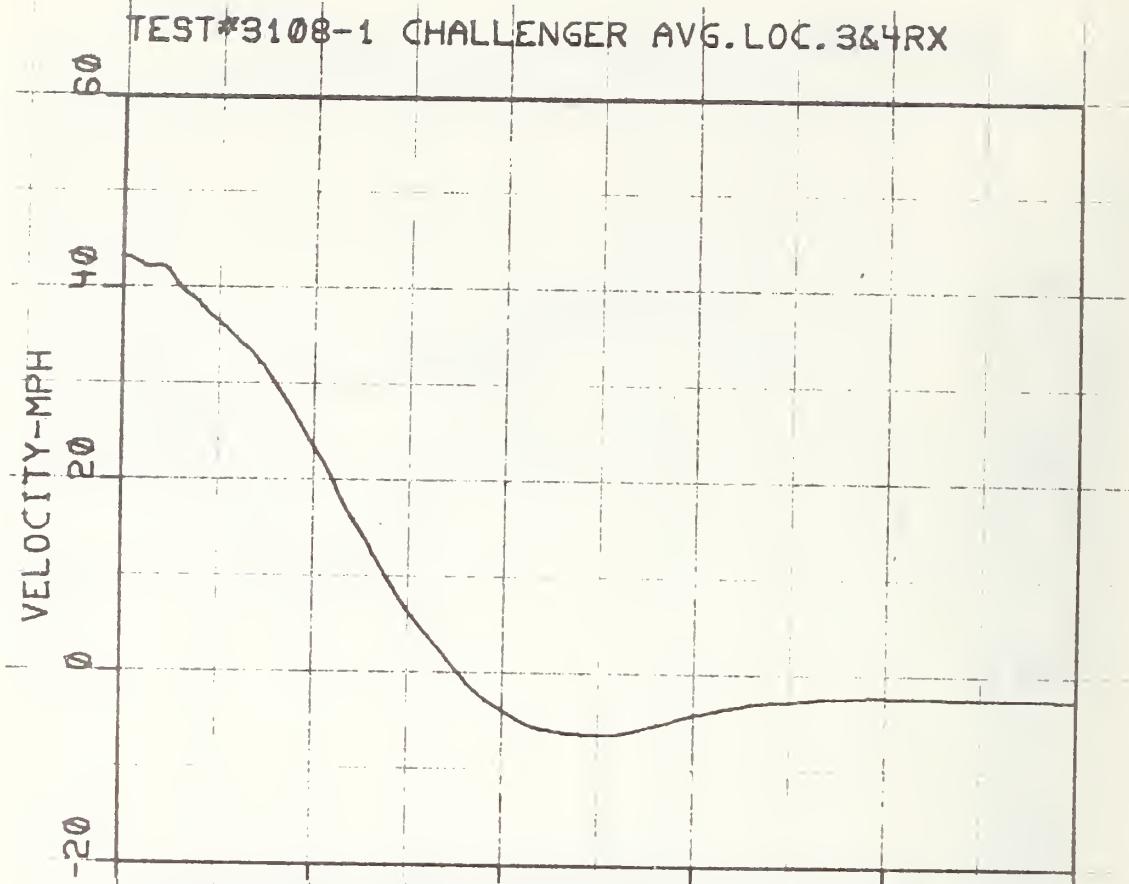
TEST#3108-1 CHALLENGER AVG.LOC. 3&4X



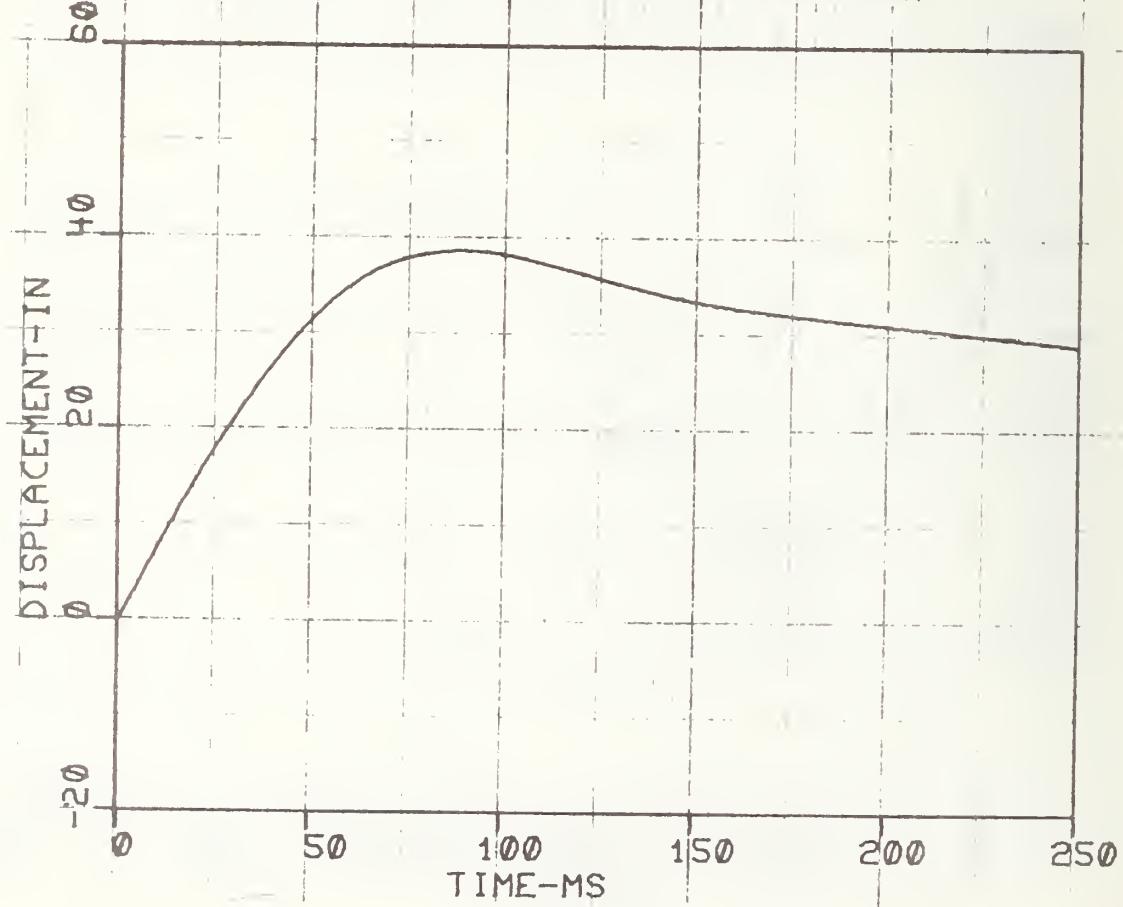
TEST#3108-1 CHALLENGER AVG.LOC. 3&4RX



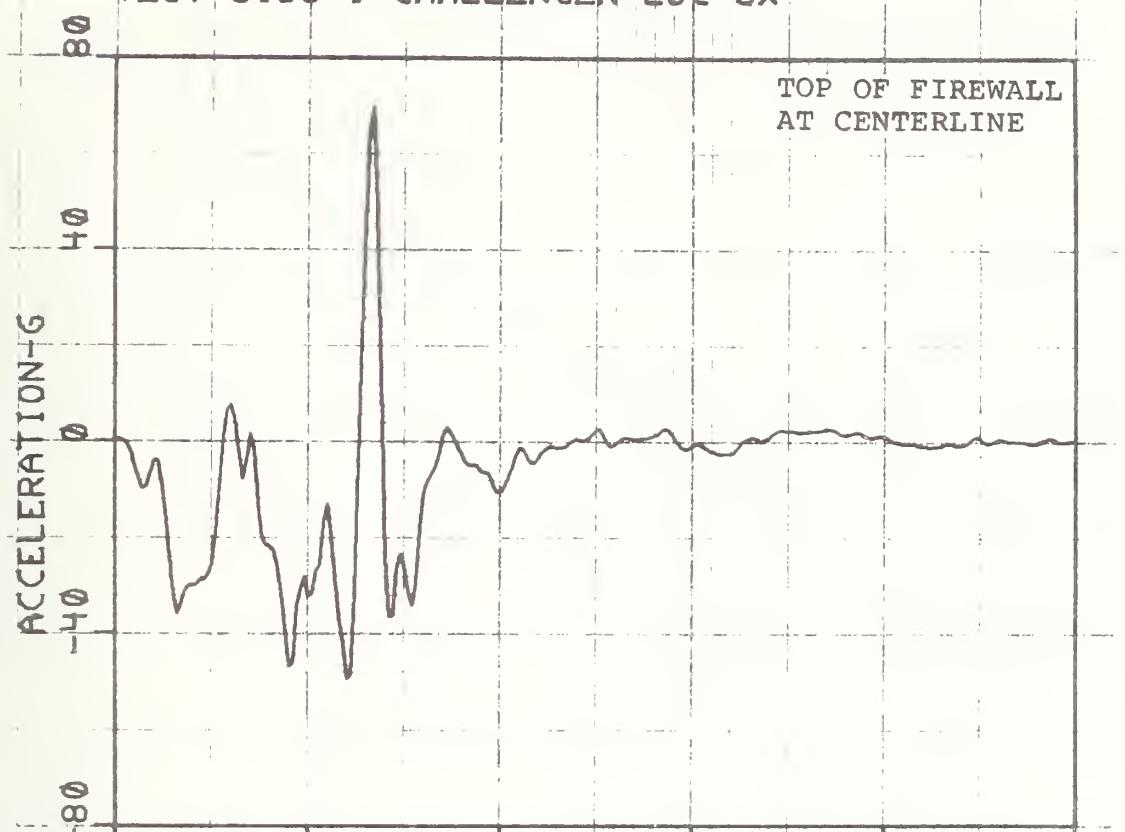
TEST#3108-1 CHALLENGER AVG. LOC. 3&4RX



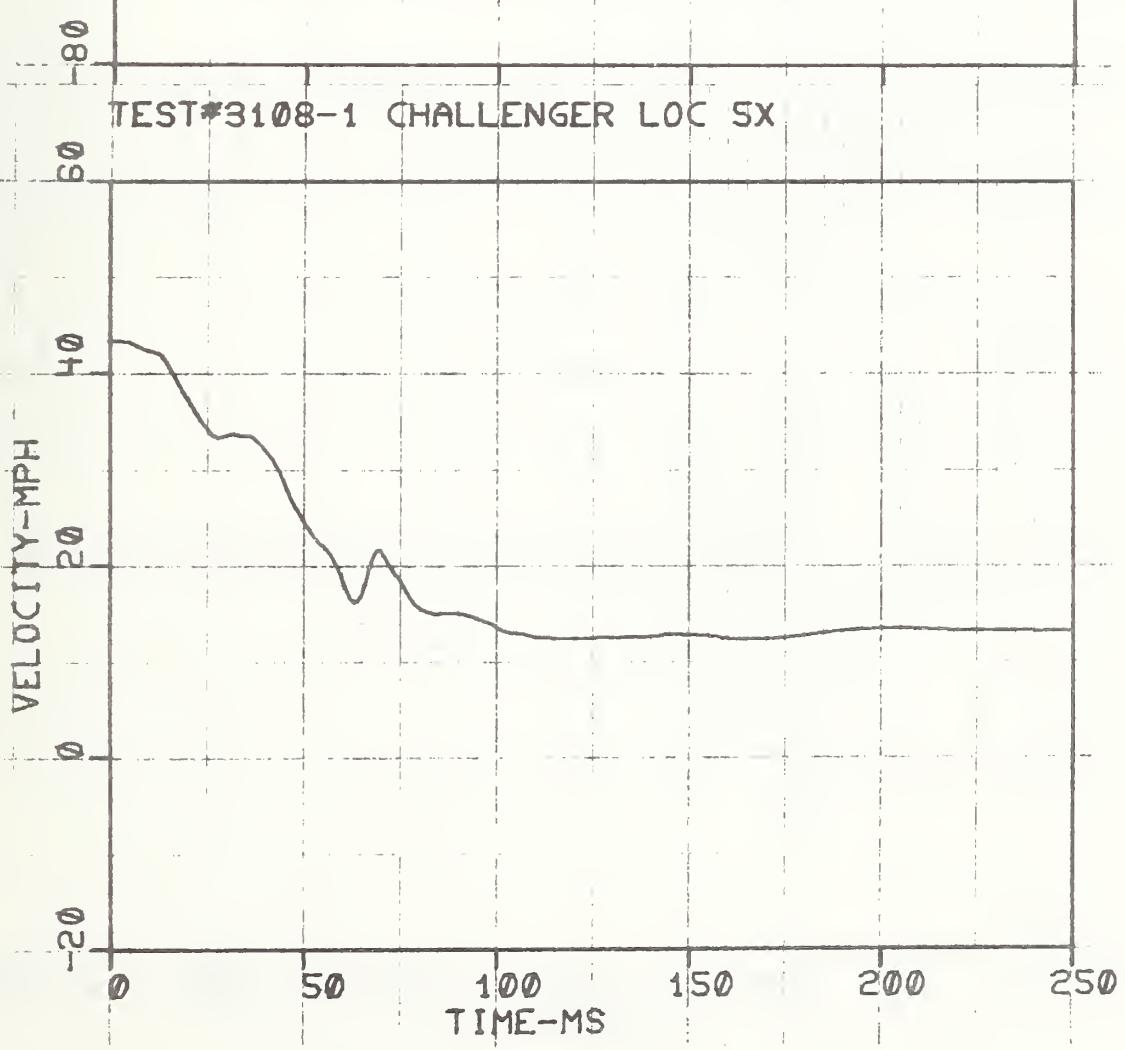
TEST#3108-1 CHALLENGER AVG. LOC. 3&4RX



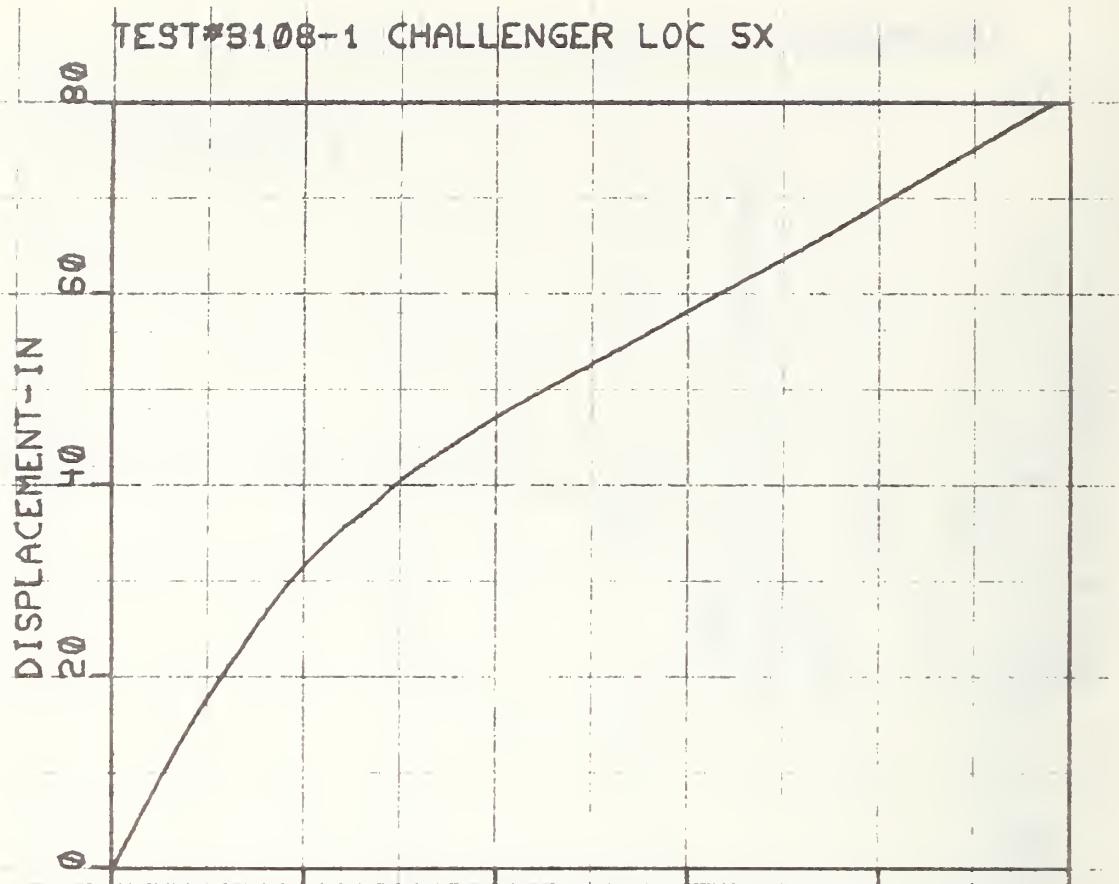
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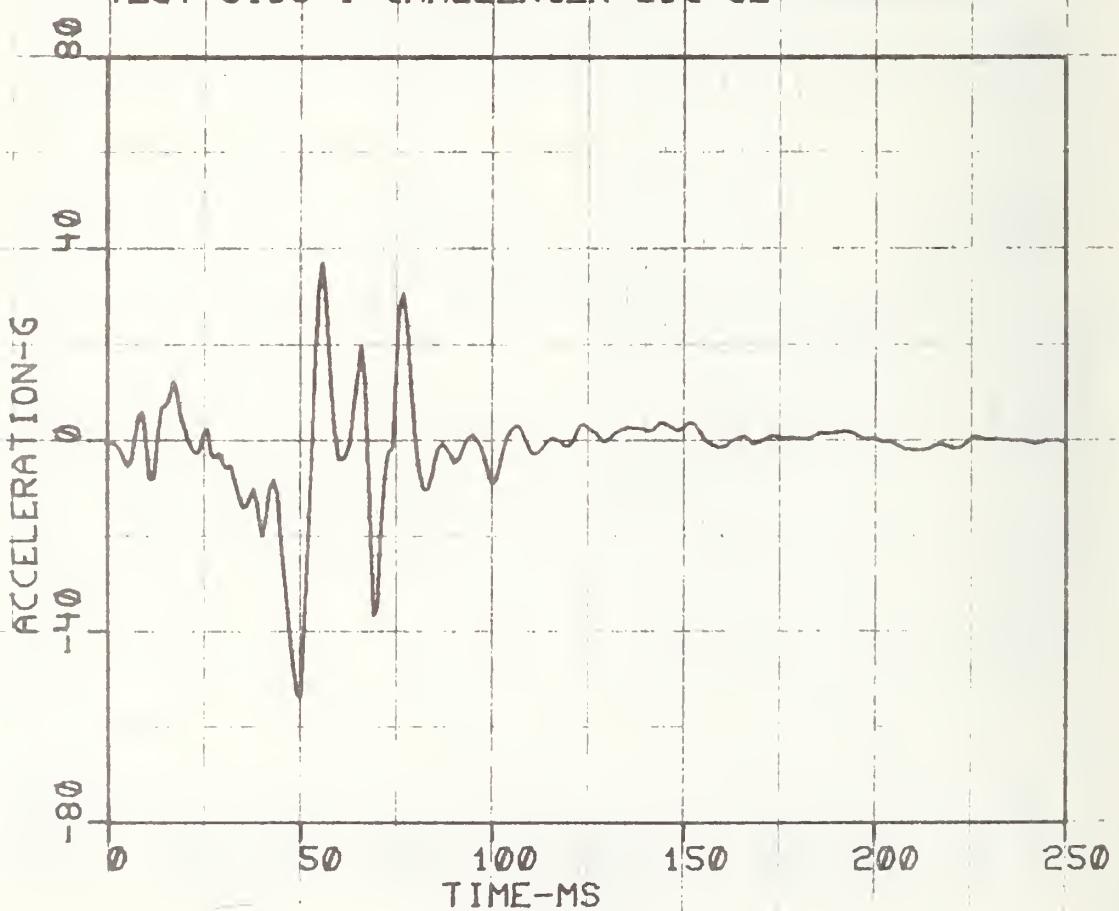
TEST#3108-1 CHALLENGER LOC SX



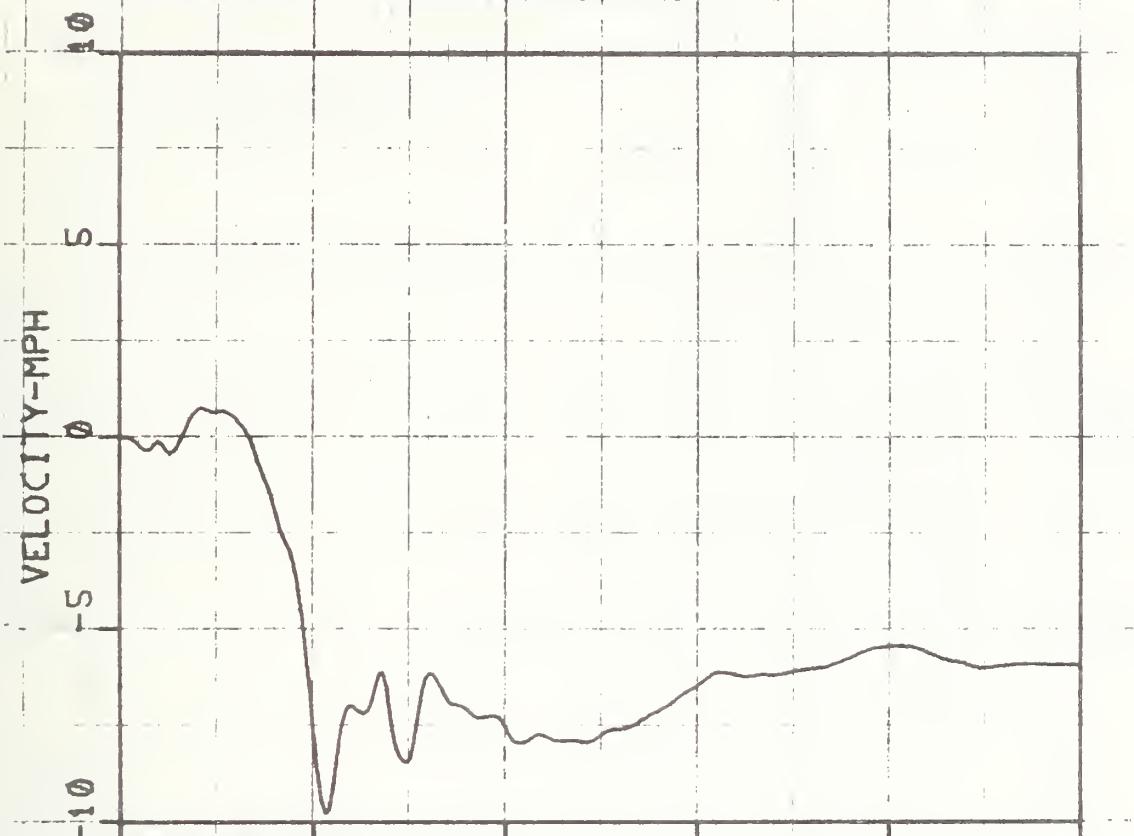
TEST#3108-1 CHALLENGER LOC 5X



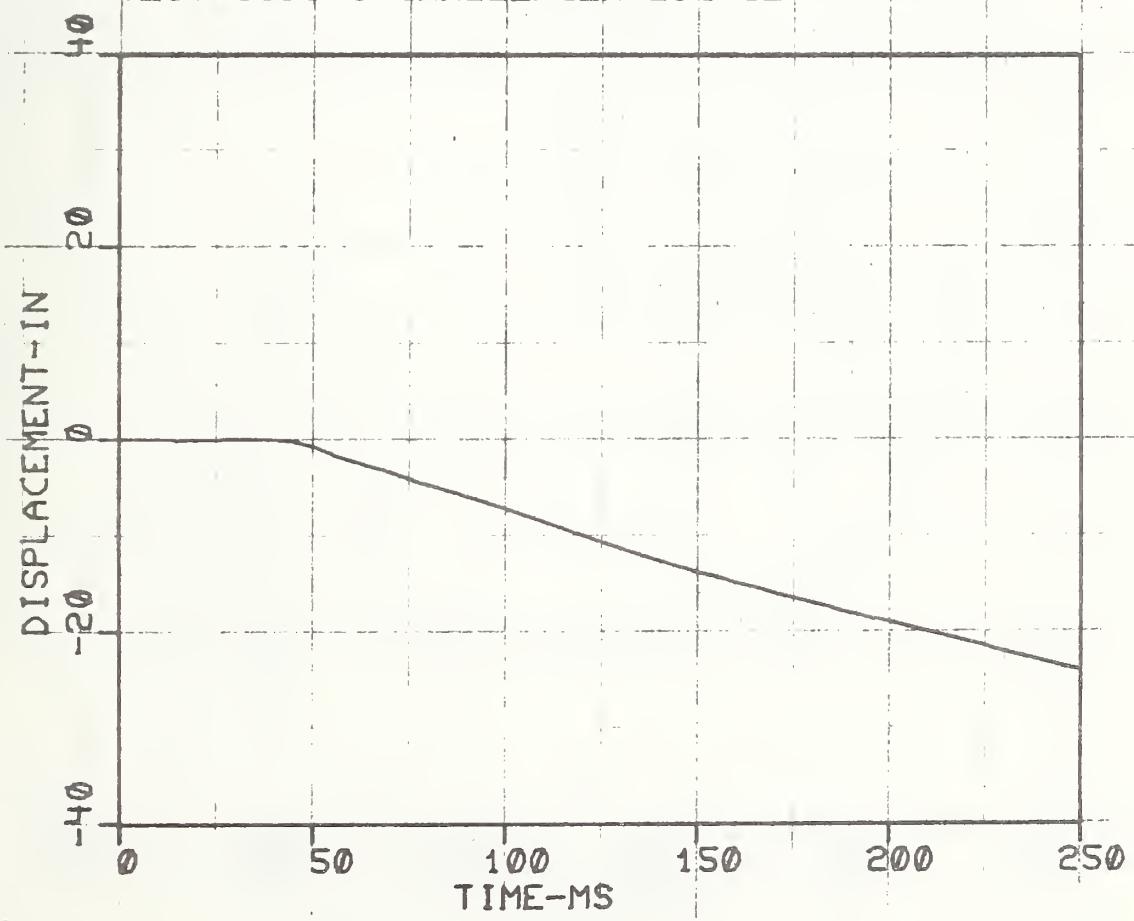
TEST#3108-1 CHALLENGER LOC 5Z



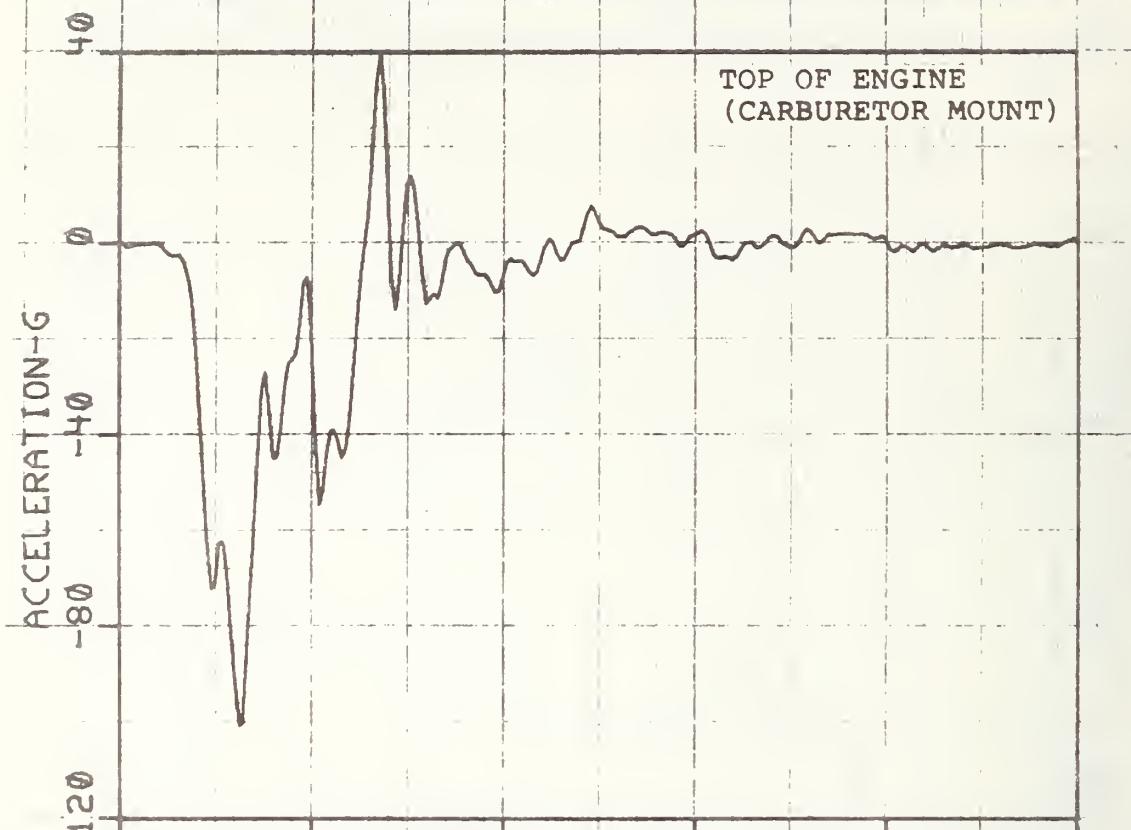
TEST#3108-1 CHALLENGER LOC 5Z



TEST#3108-1 CHALLENGER LOC 5Z

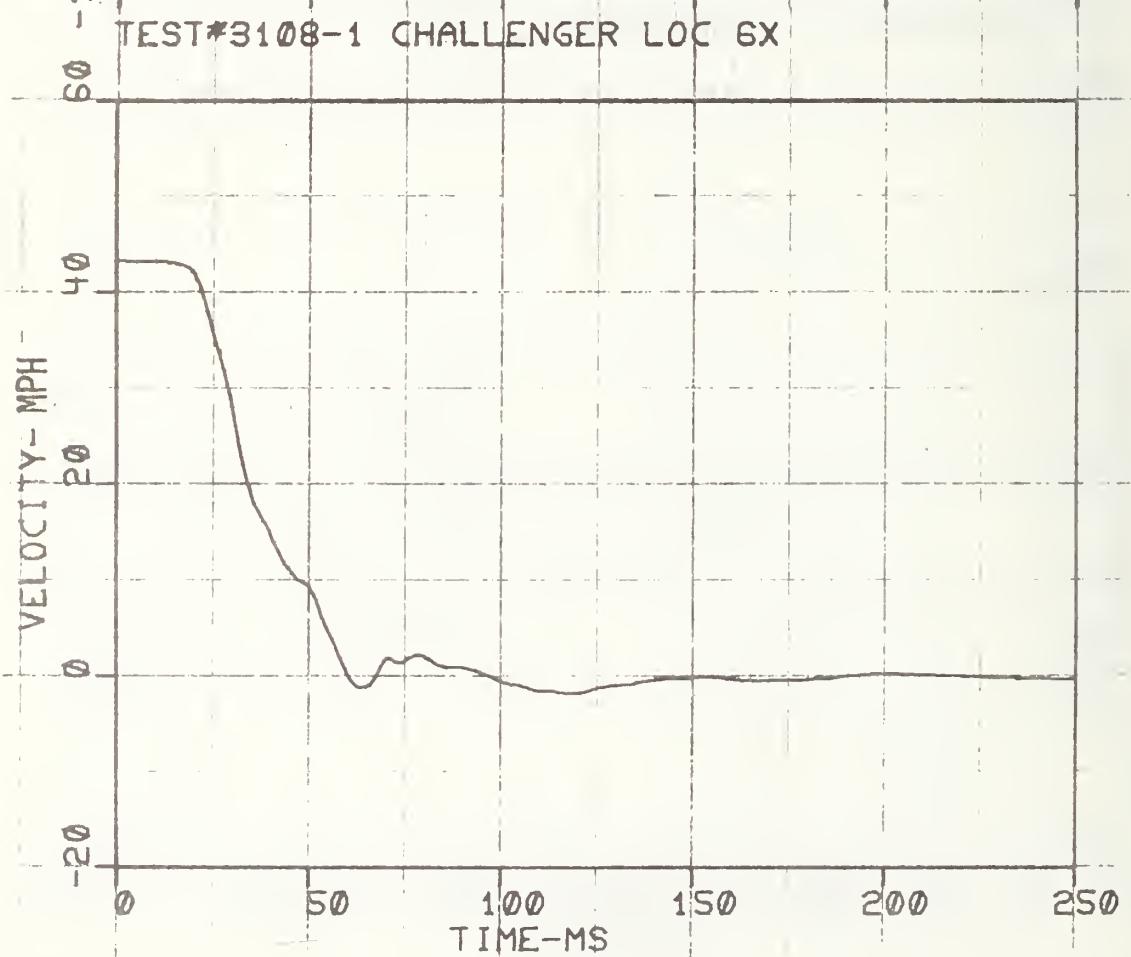


TEST#3108-1 CHALLENGER LOC 6X

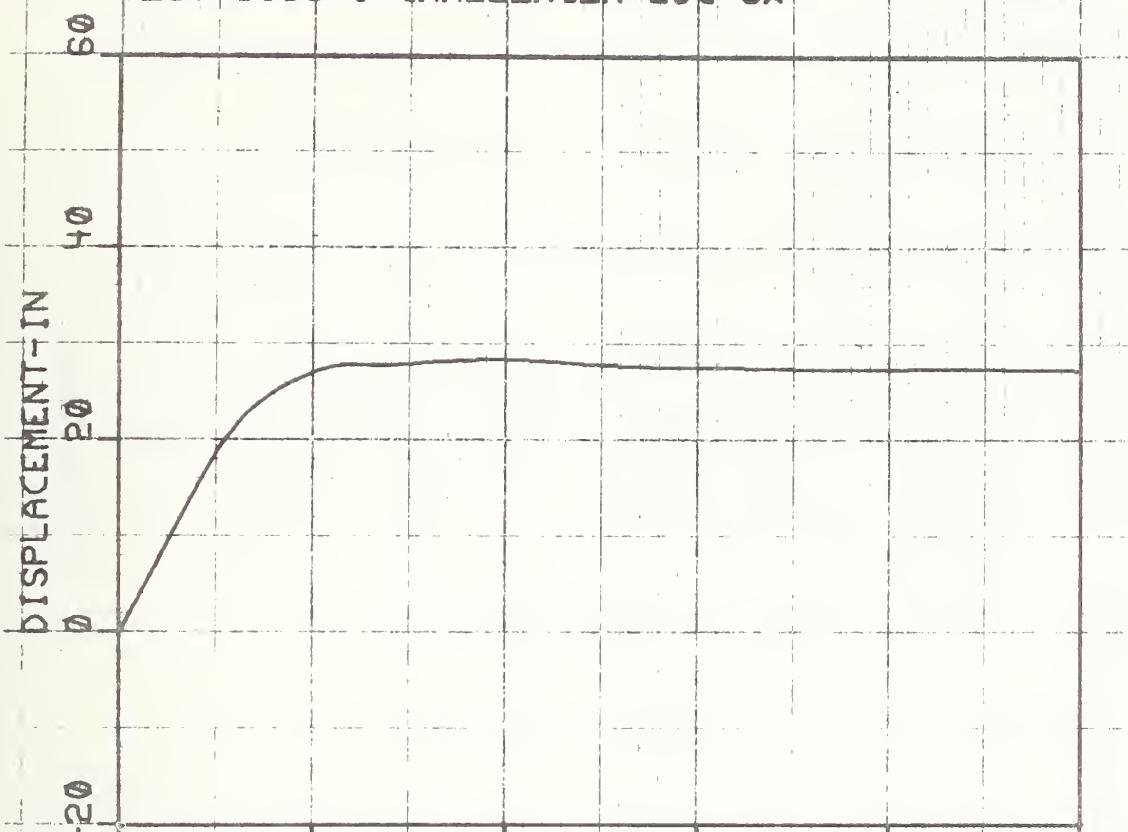


TOP OF ENGINE
(CARBURETOR MOUNT)

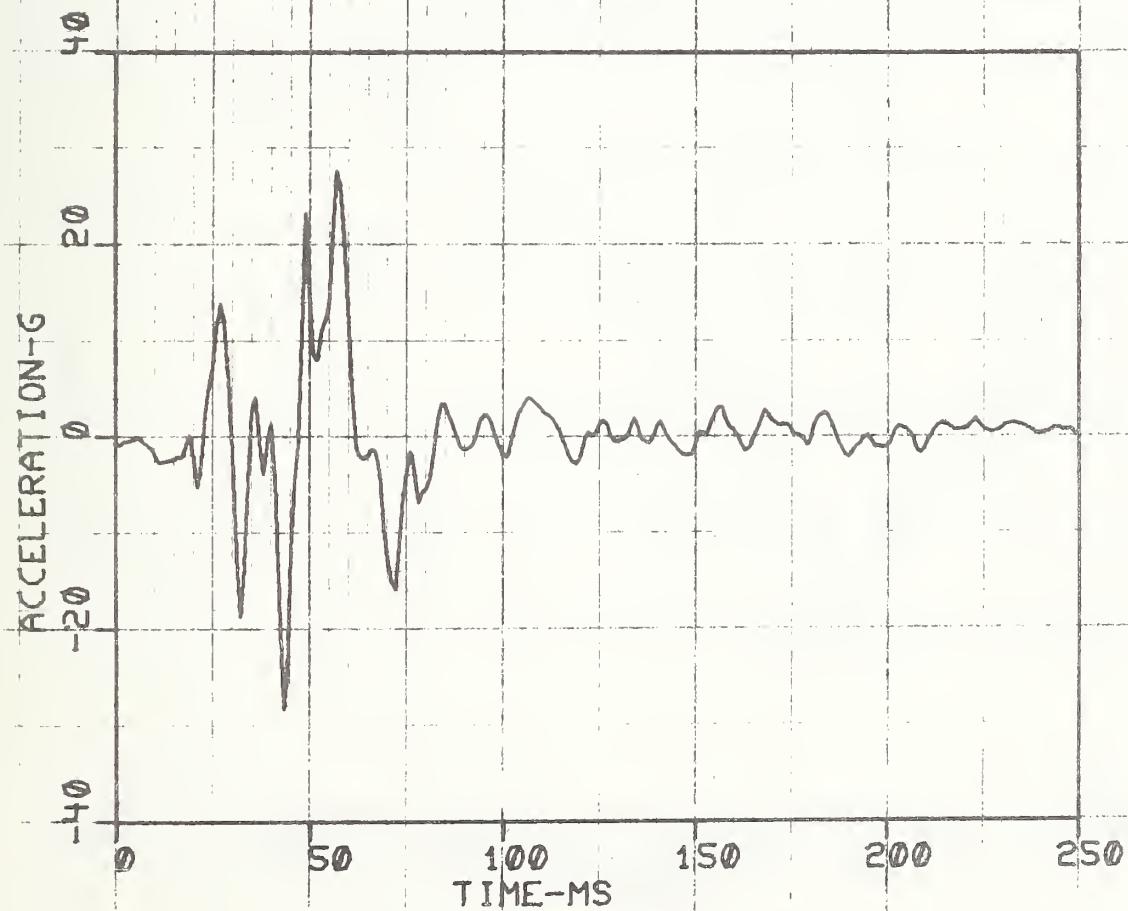
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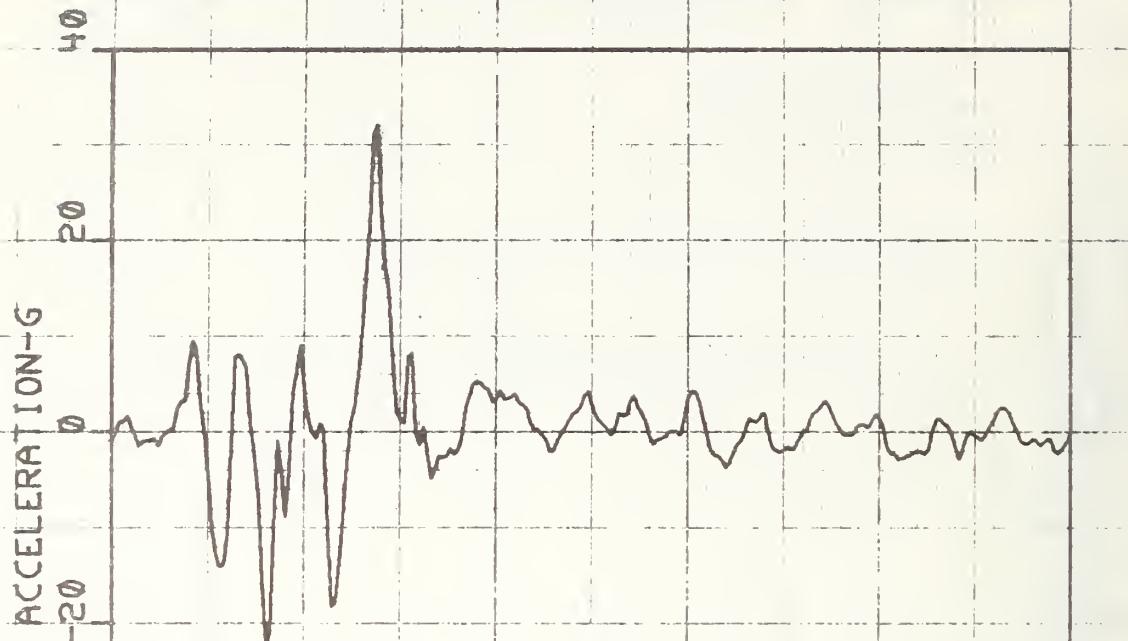
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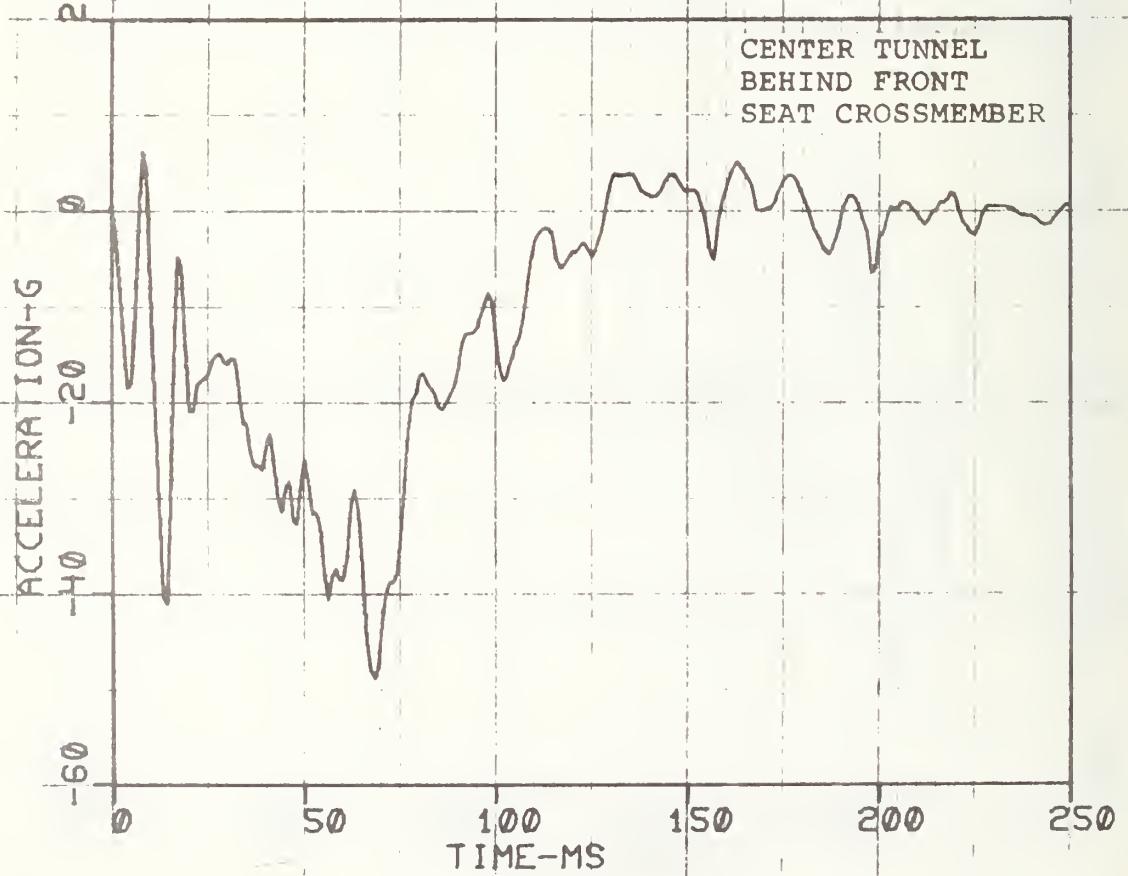
TEST#3108-1 CHALLENGER LOC 6Y



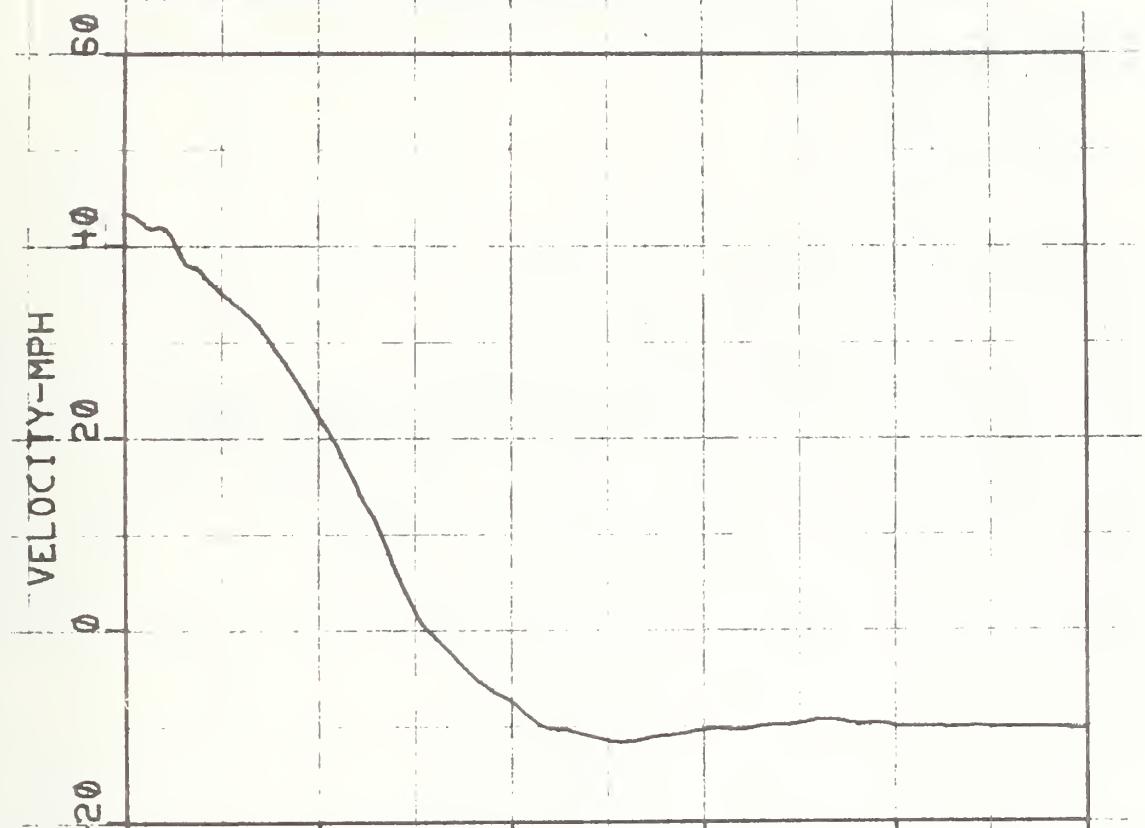
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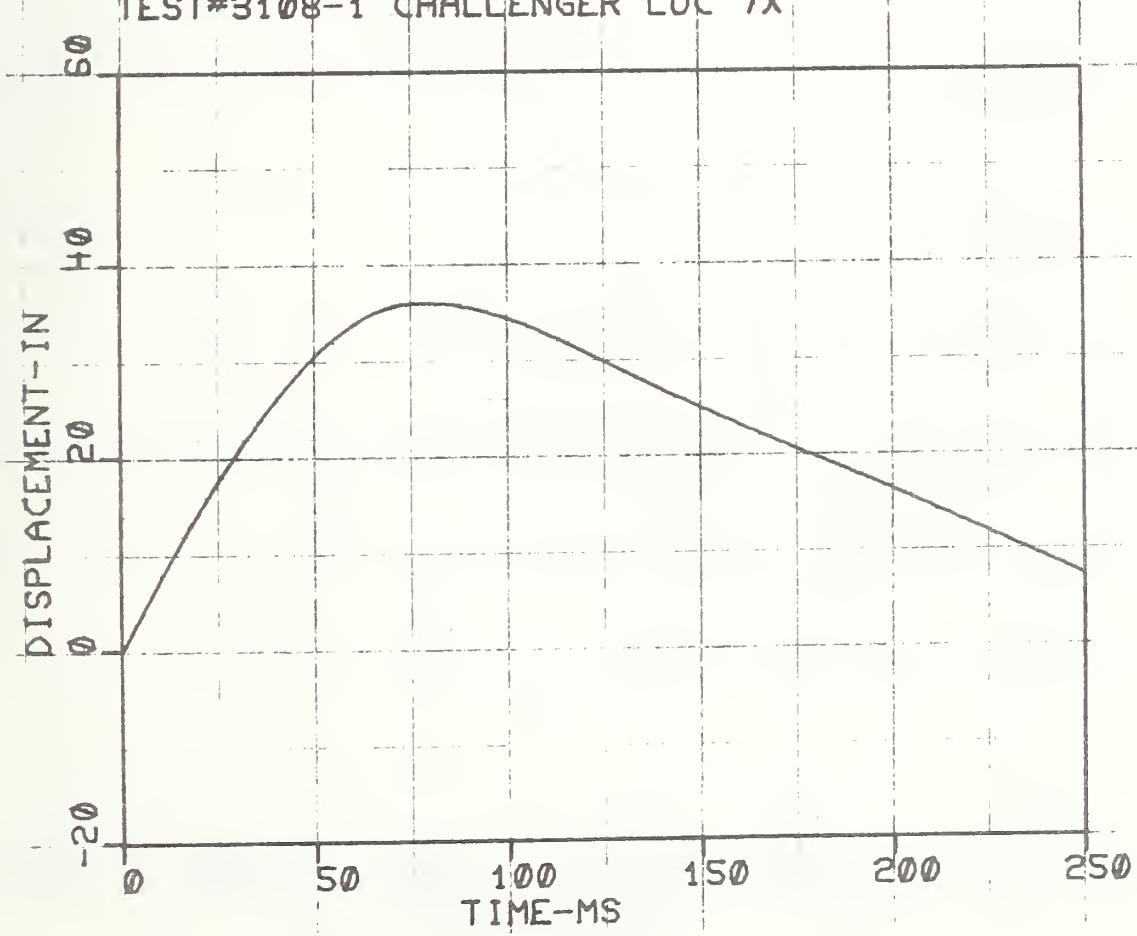
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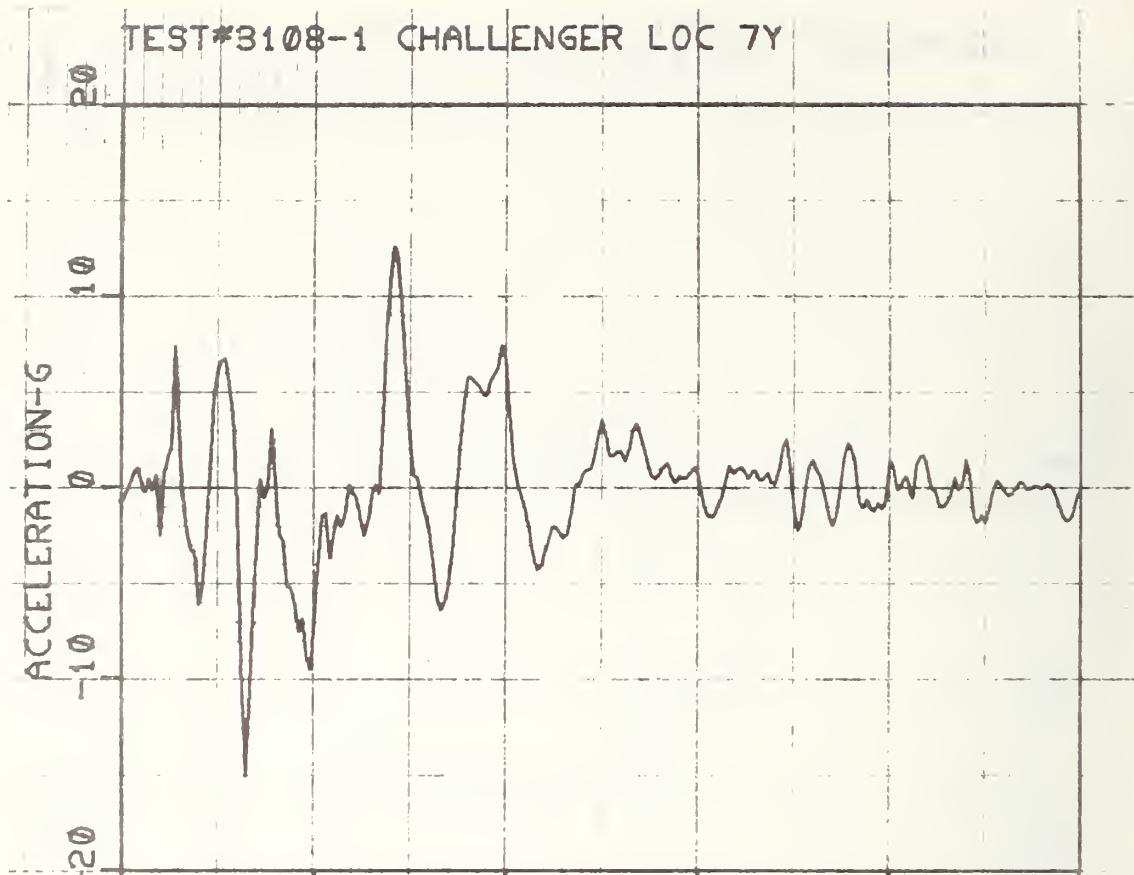
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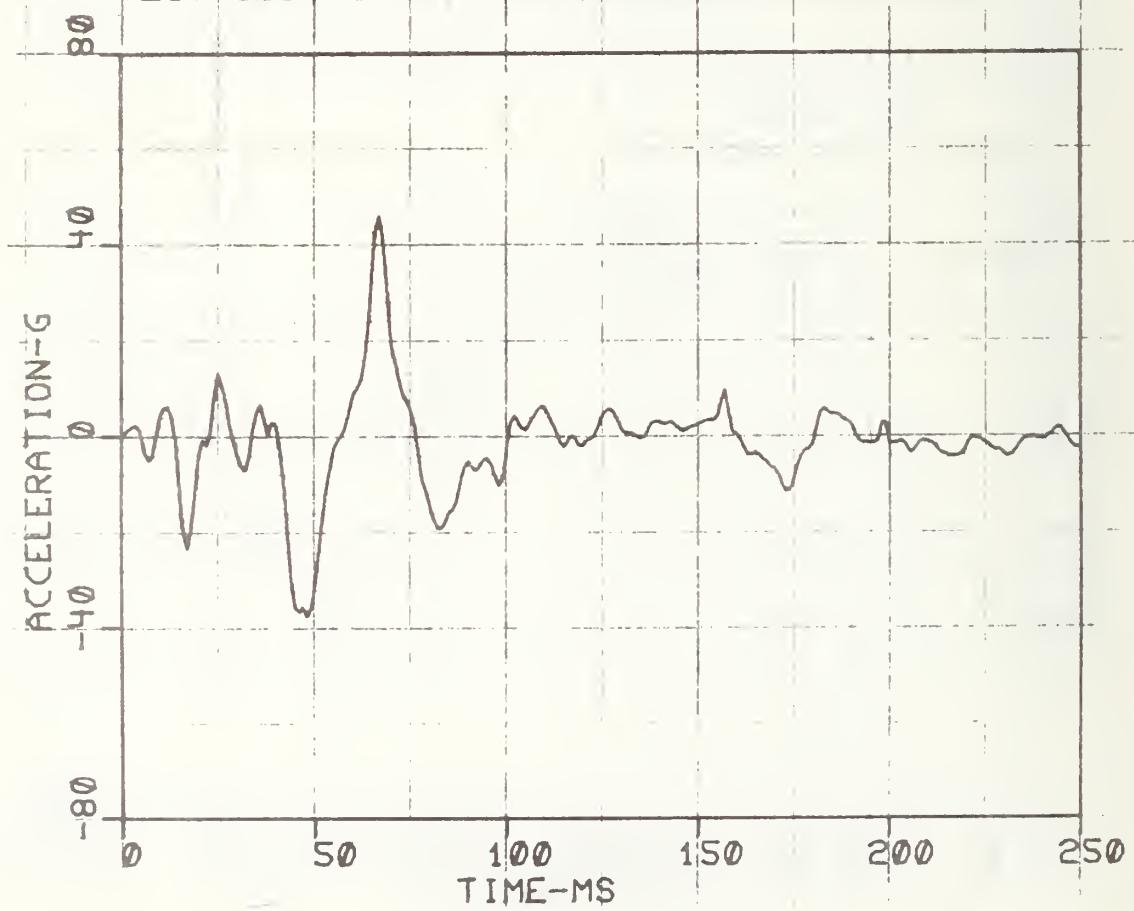
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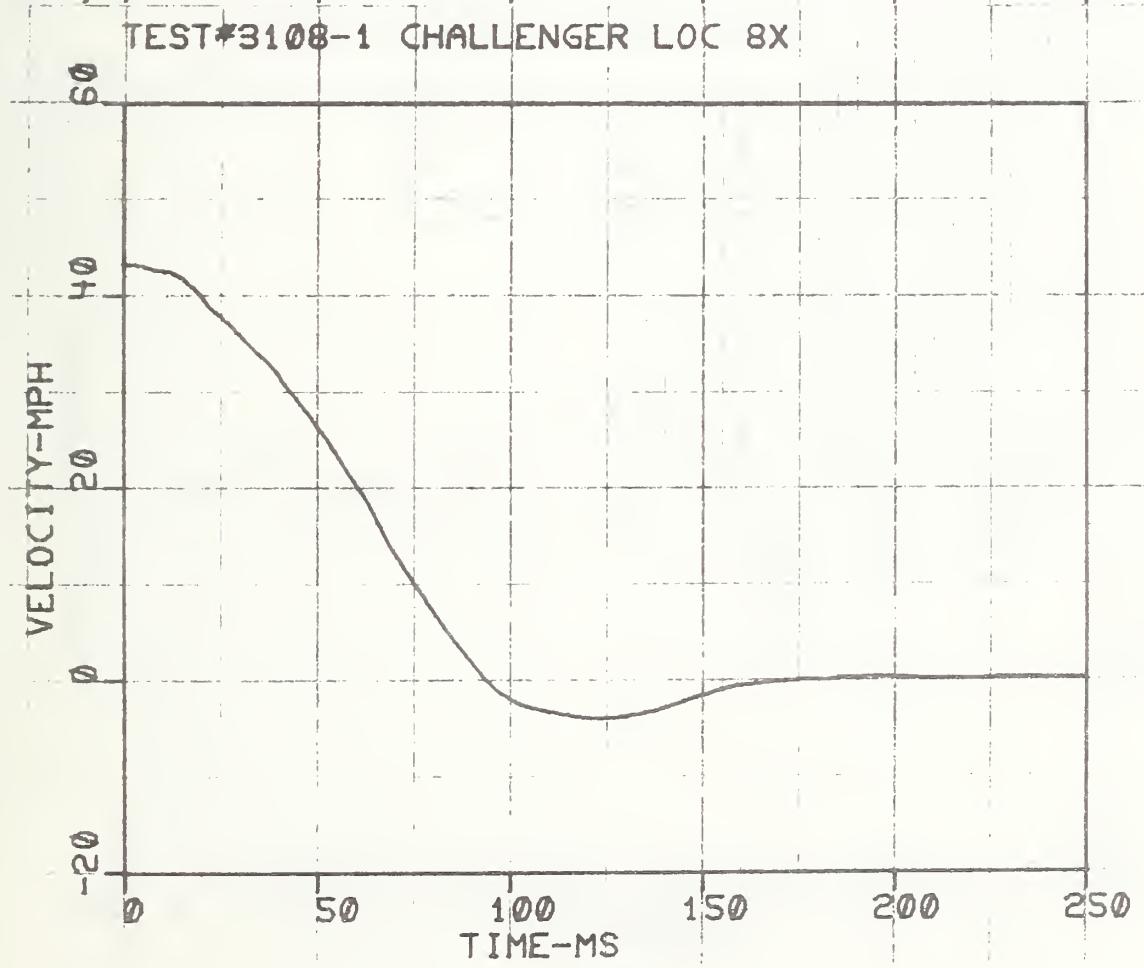
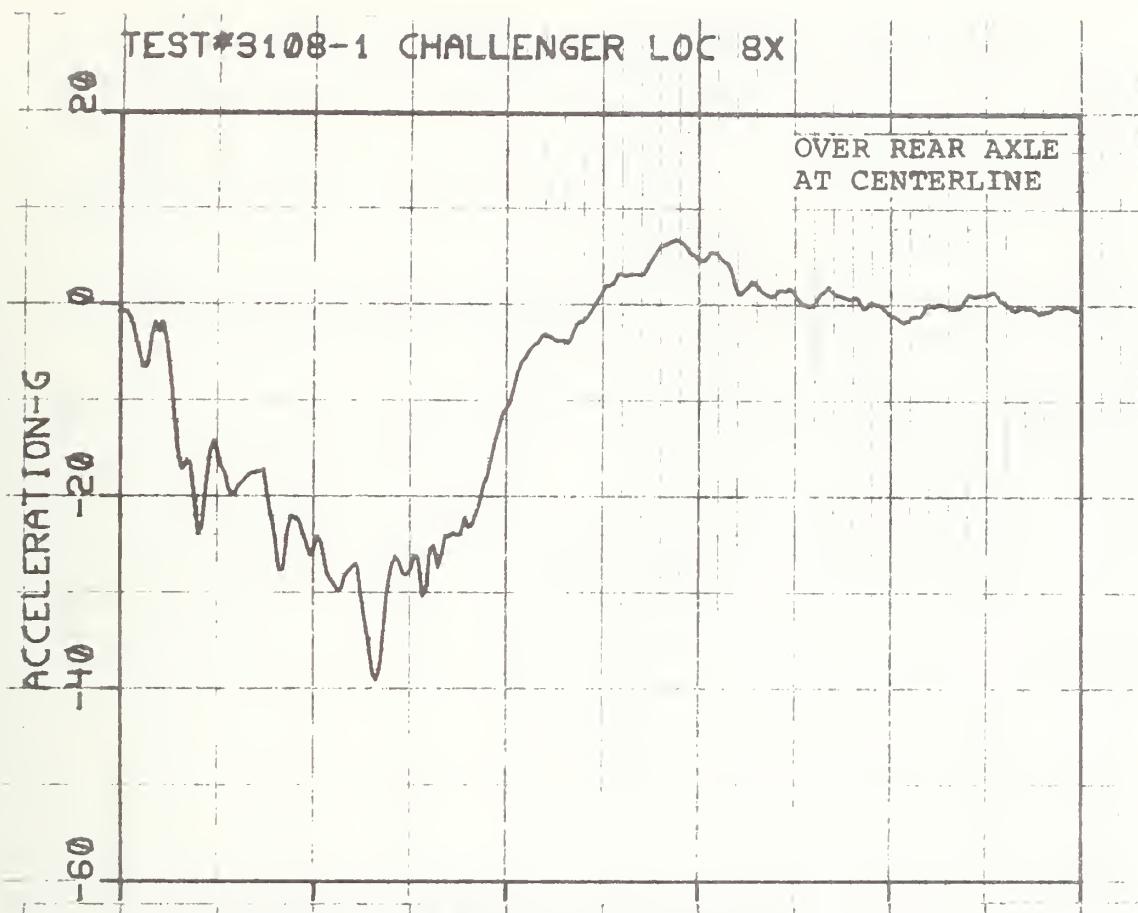


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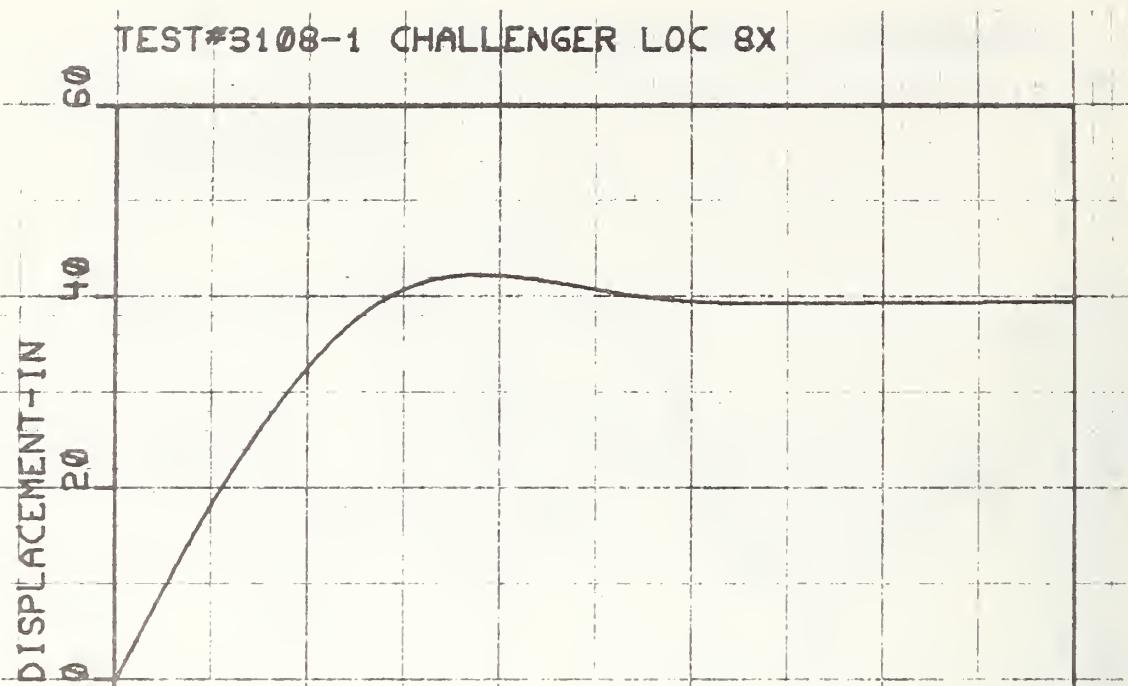


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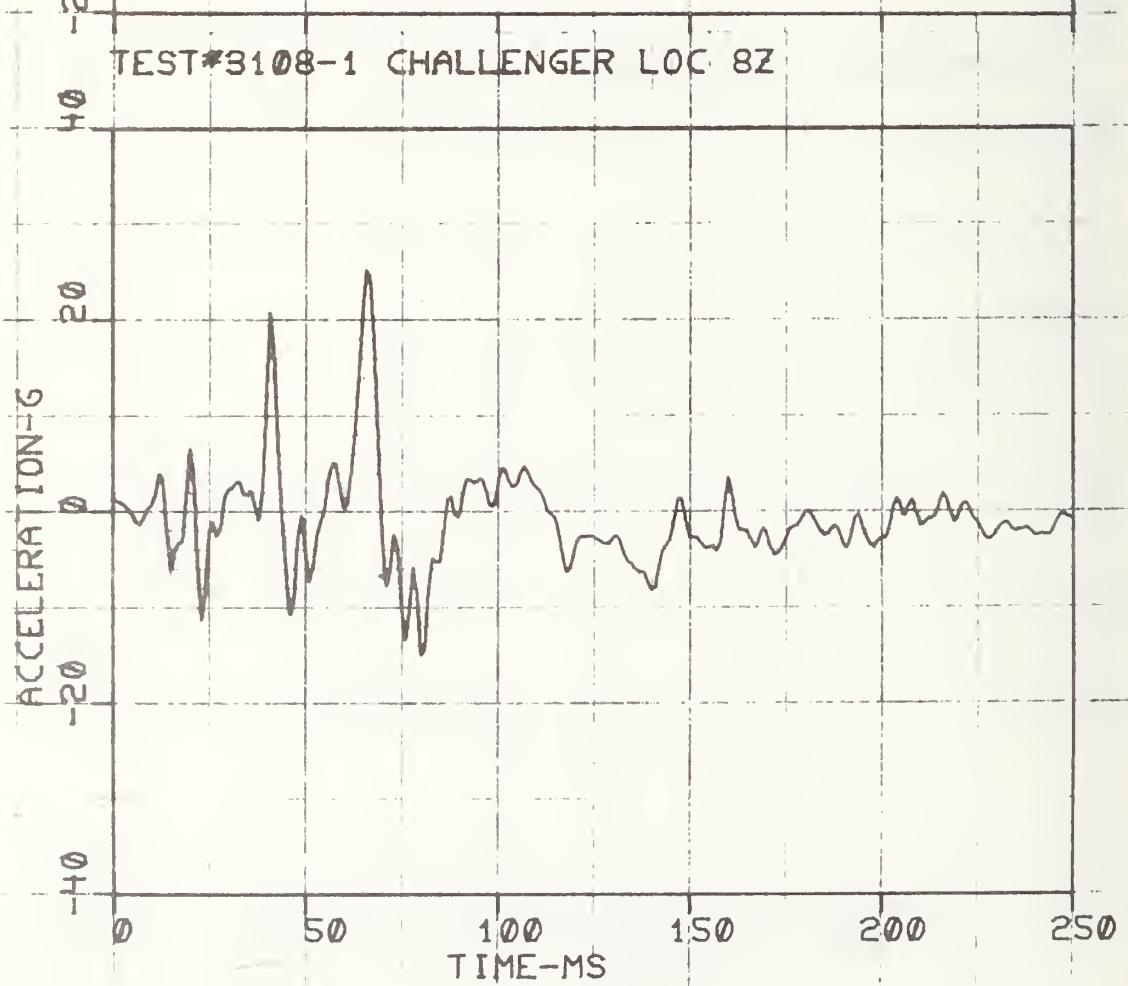




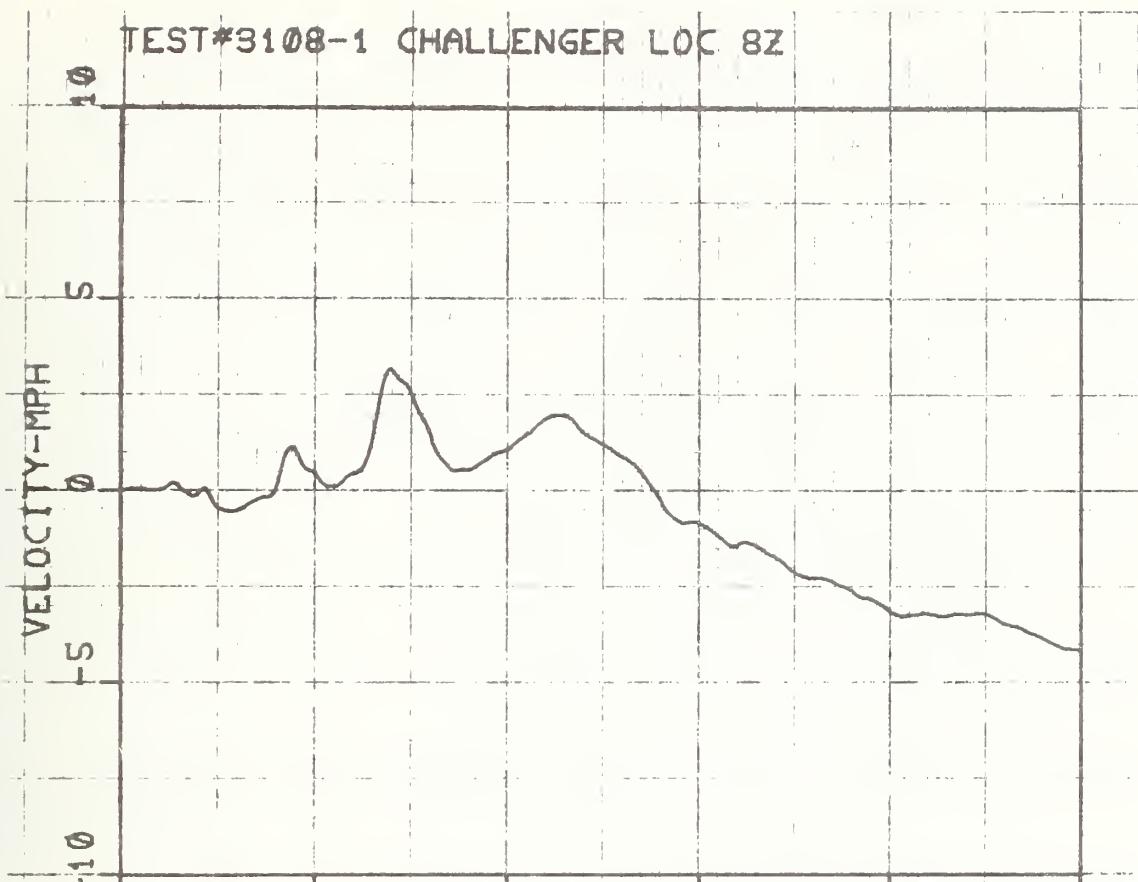
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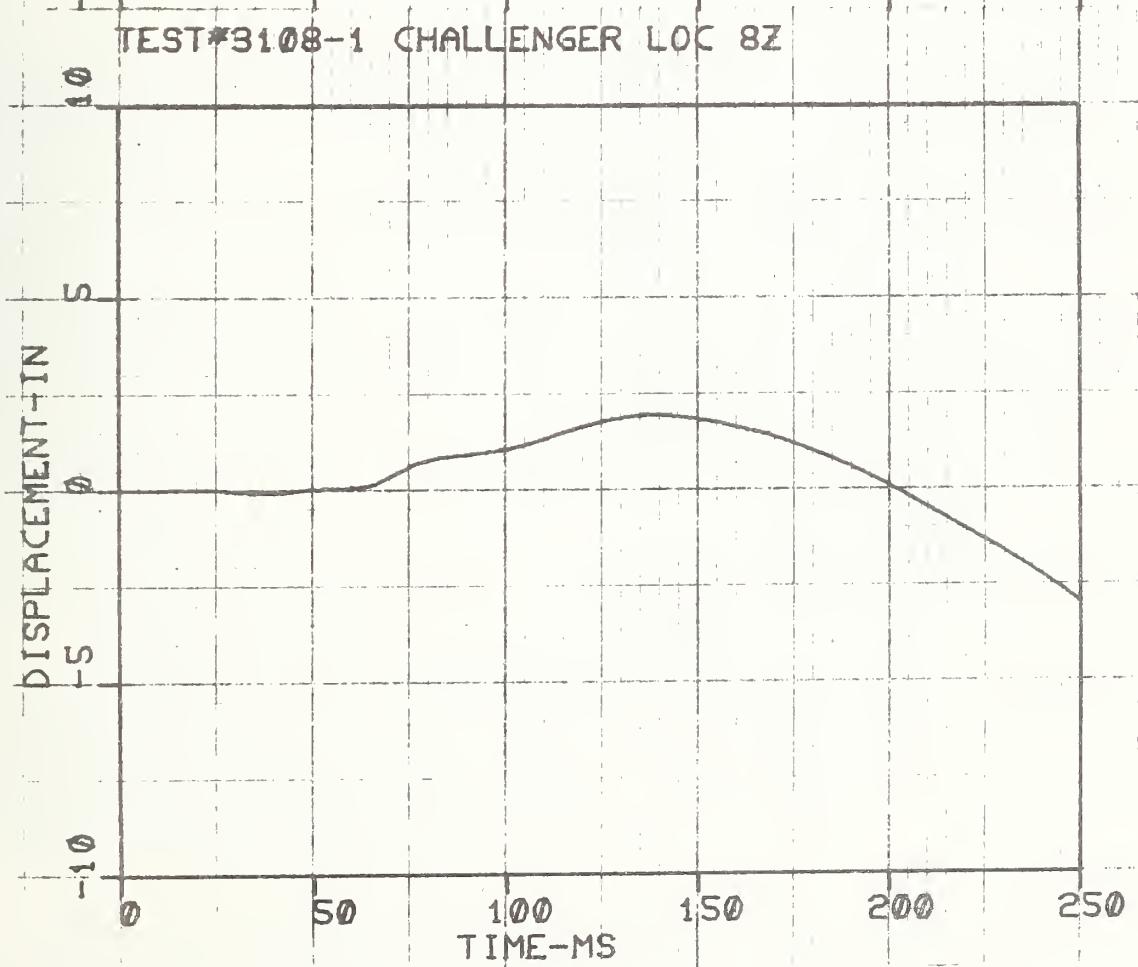
TEST#3108-1 CHALLENGER LOC 8Z



TEST#3108-1 CHALLENGER LOC 8Z



TEST#3108-1 CHALLENGER LOC 8Z



APPENDIX C
ADDITIONAL PHOTOGRAPHS OF THE CRASH TEST

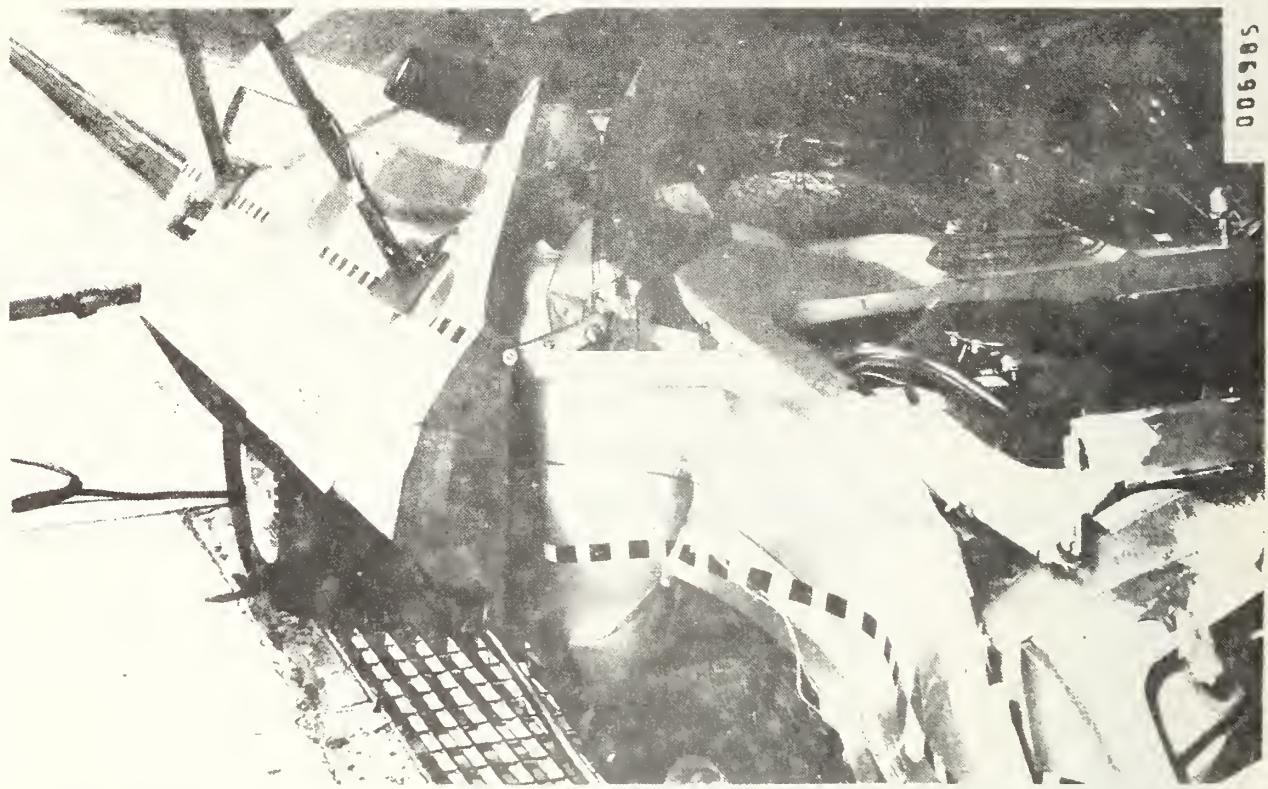


FIGURE C-1. POST-TEST VIEW OF MINICARS RSV
RIGHT FRONTAL AND SIDE DAMAGE.

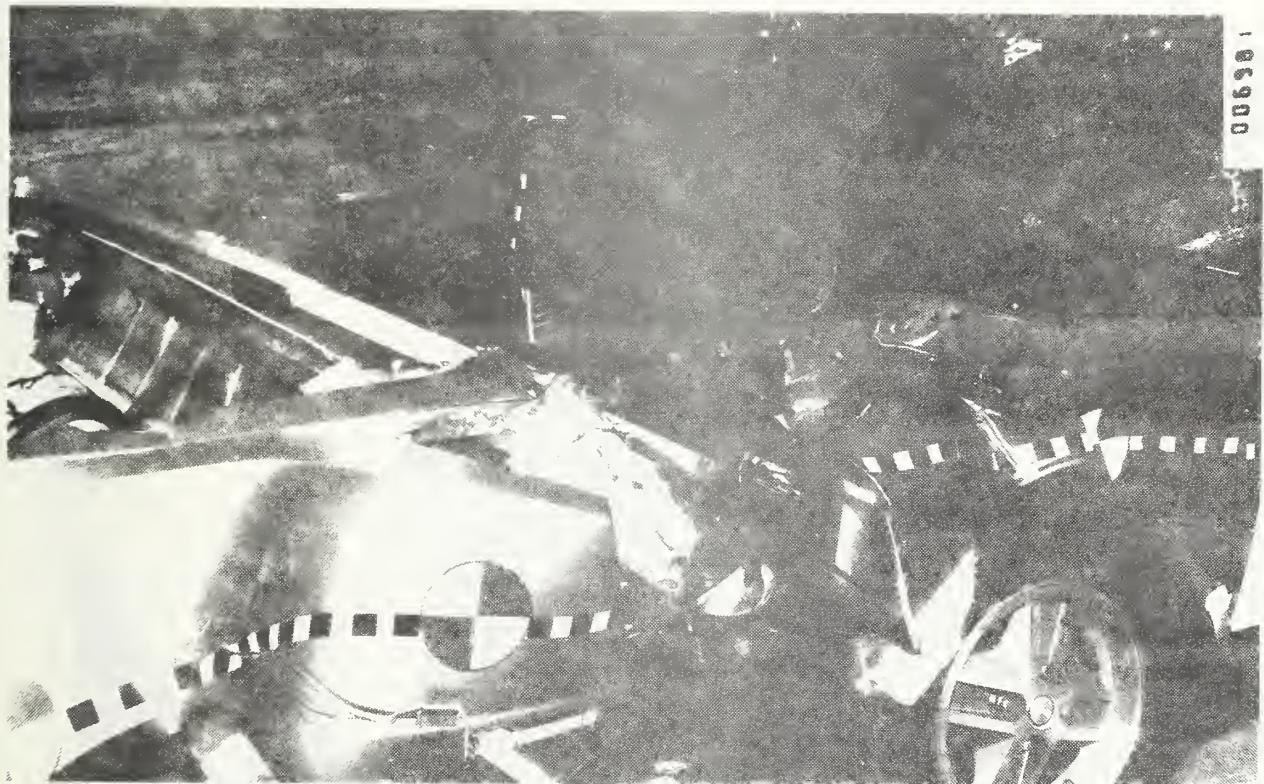
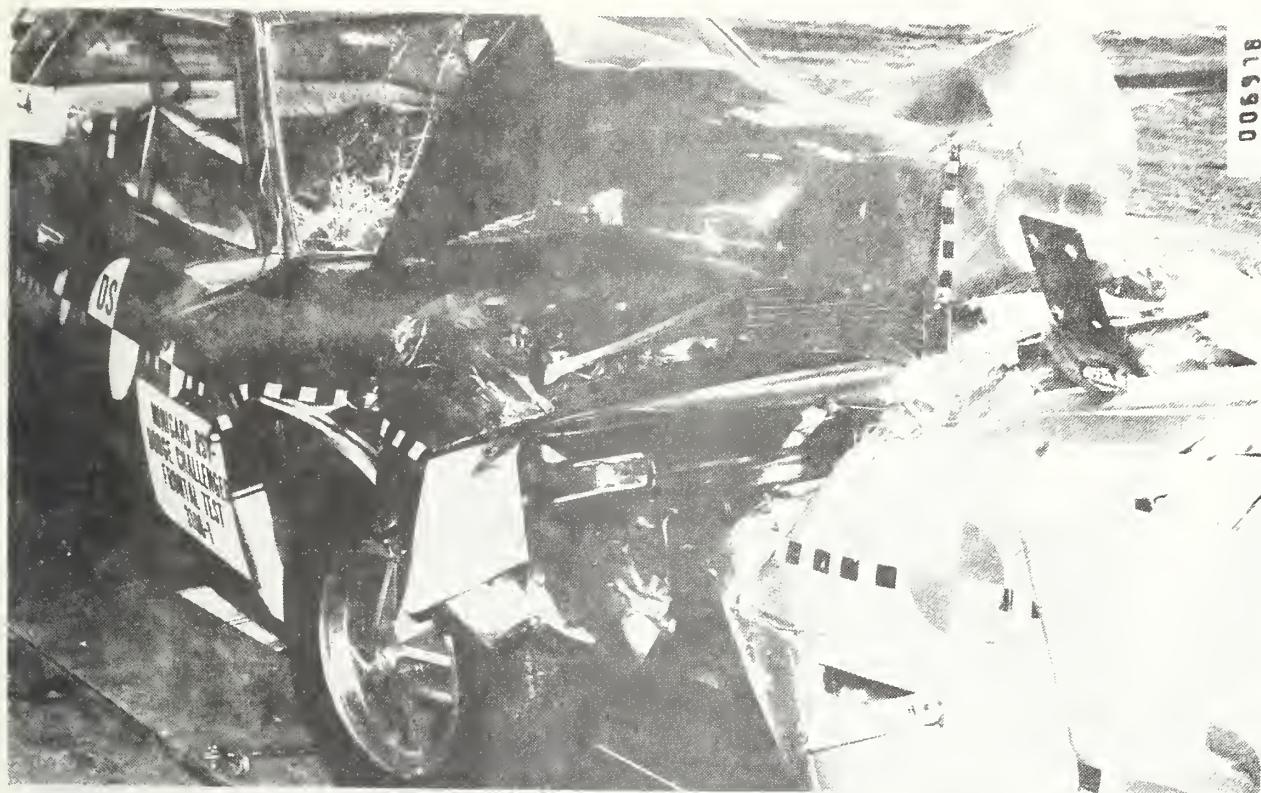


FIGURE C-2. POST-TEST VIEW OF DODGE CHALLENGER RIGHT AND LEFT FRONTAL DAMAGE.

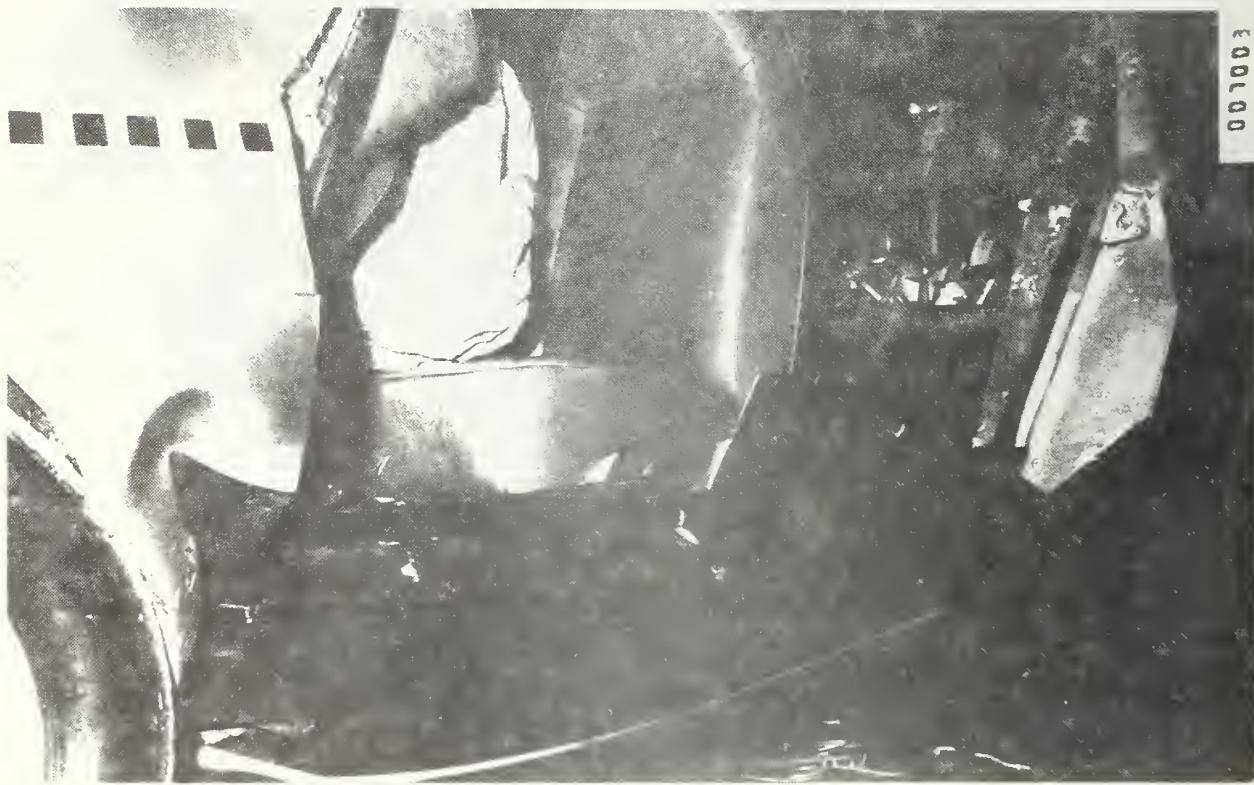


FIGURE C-3. POST-TEST VIEWS OF MINICARS RSV DRIVER SIDE ROCKER SILL DEFORMATION.

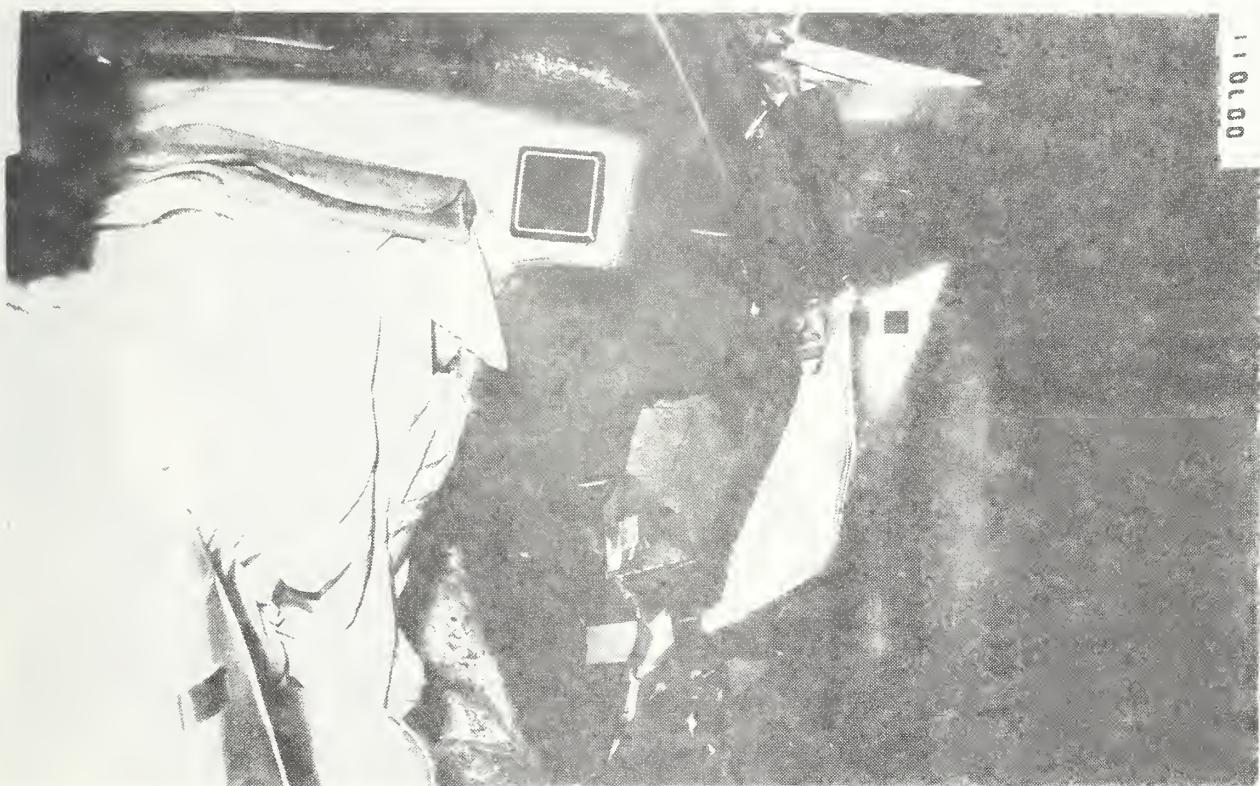
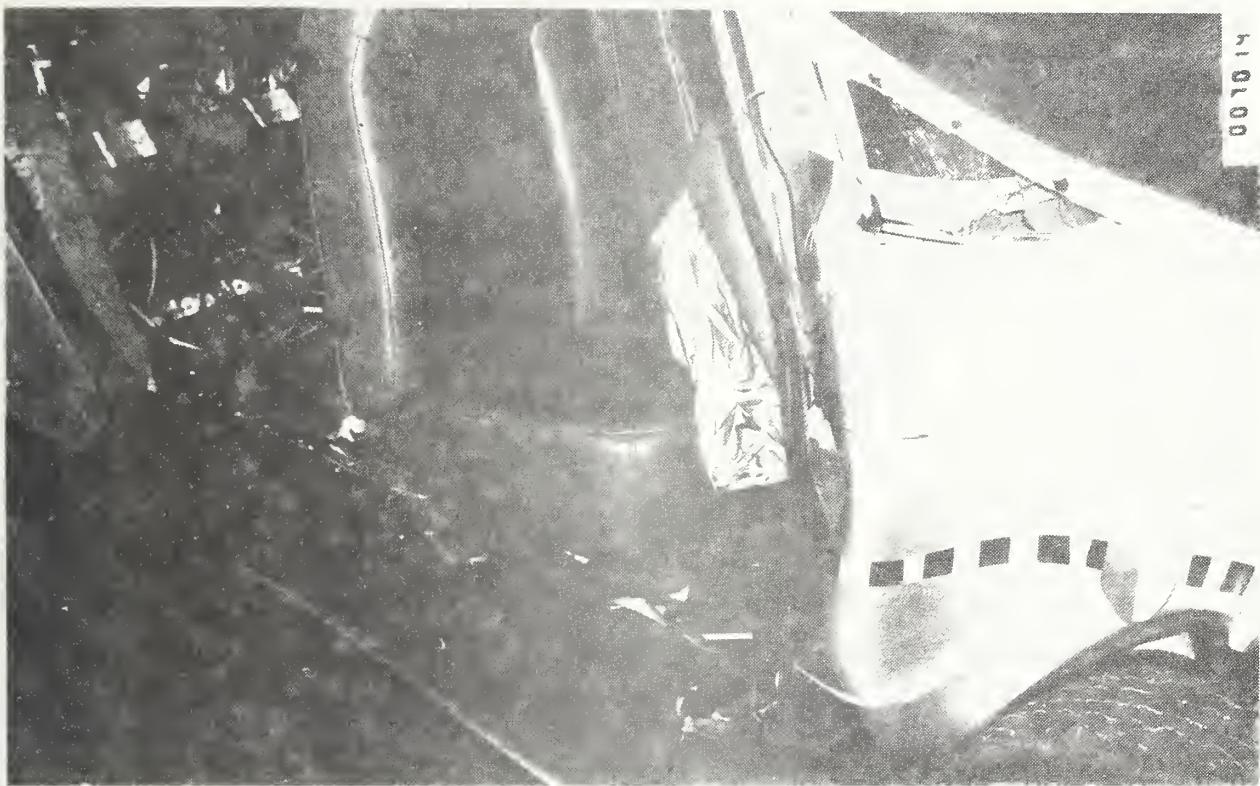


FIGURE C-4. POST-TEST VIEW OF MINICARS RSV PASSENGER SIDE ROCKER SILL DEFORMATION.

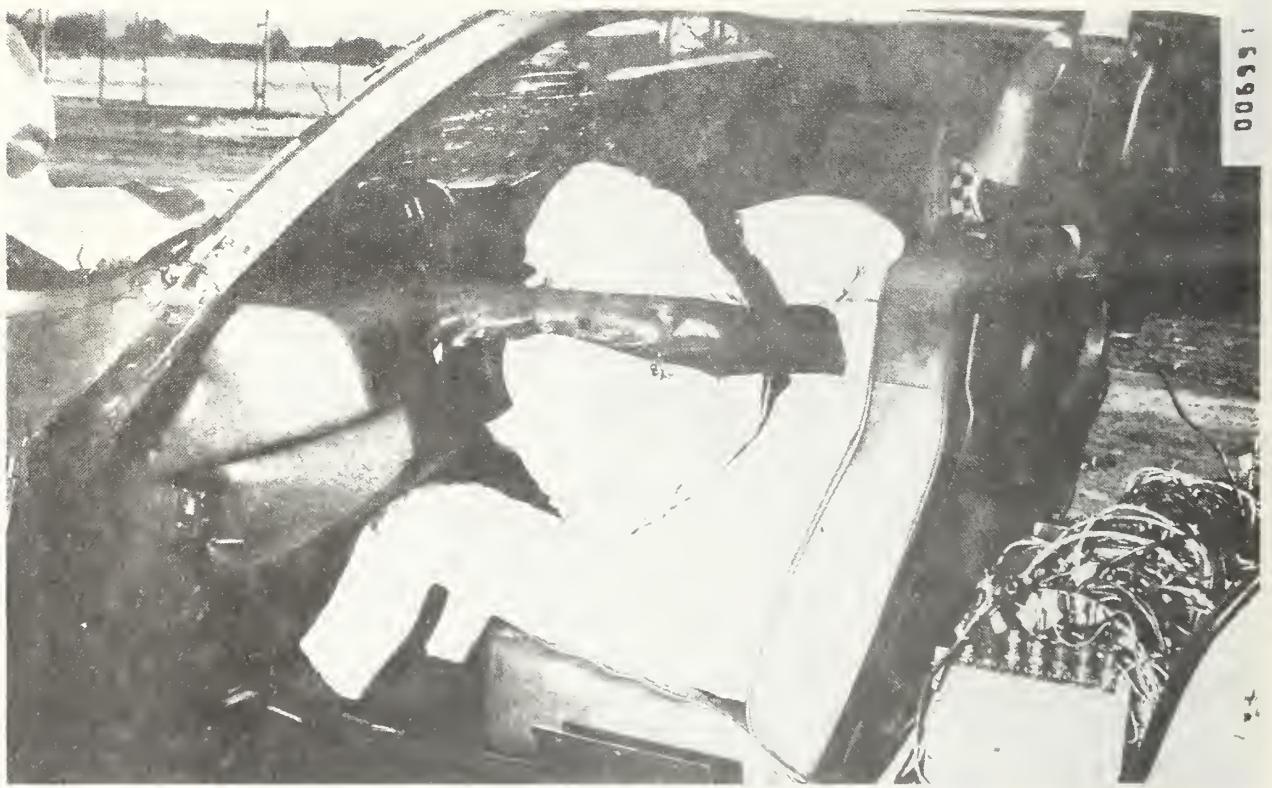


FIGURE C-5. POST-TEST VIEW OF MINICARS RSV DRIVER AND PASSENGER DUMMIES.

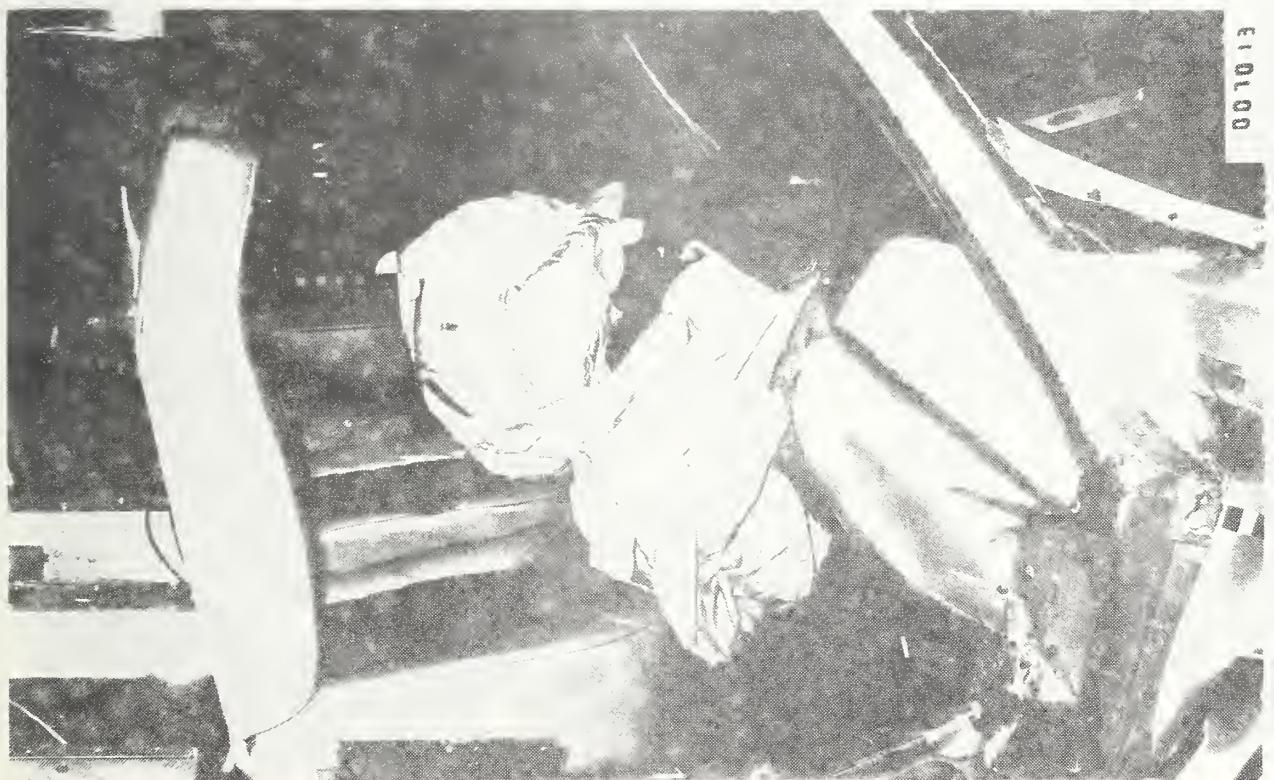
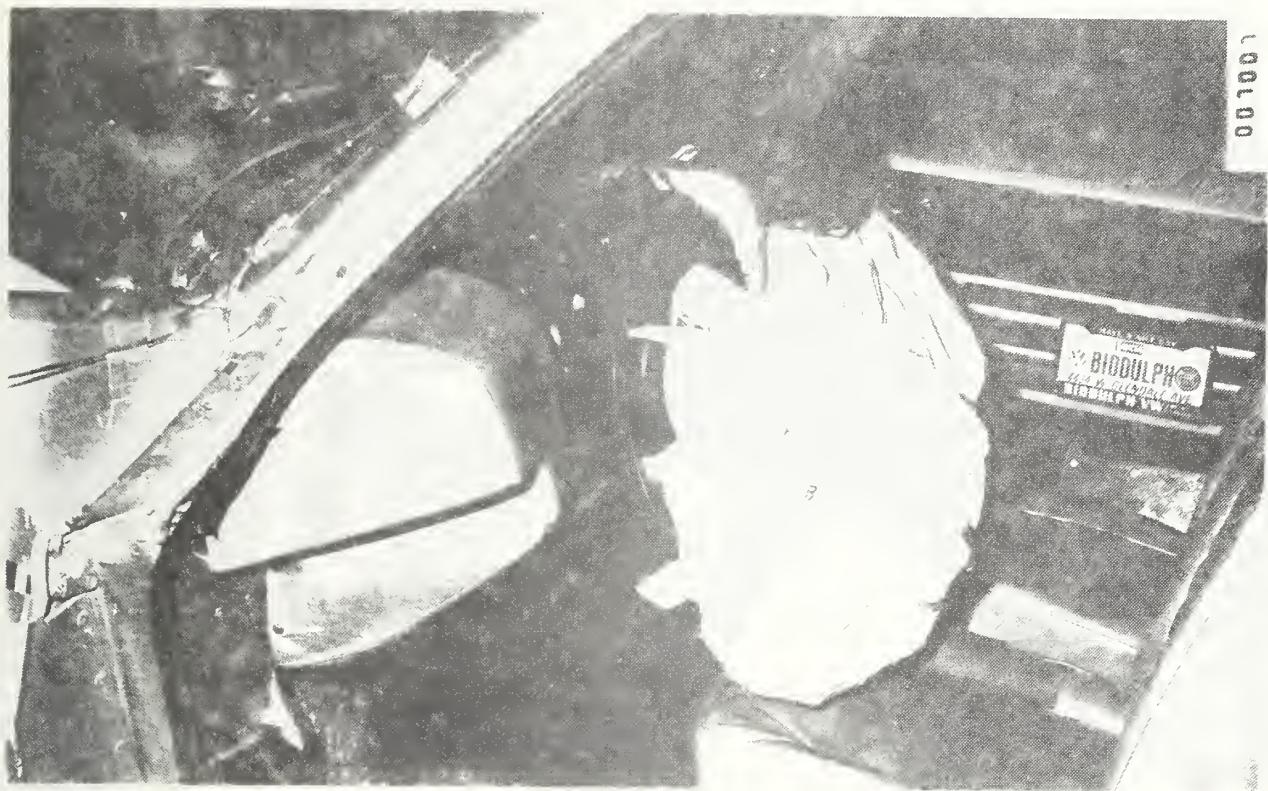


FIGURE C-6. POST-TEST SIDE VIEWS OF MINICARS RSV OCCUPANT COMPARTMENT.



FIGURE C-7. POST-TEST VIEW OF DODGE CHALLENGER DRIVER AND PASSENGER DUMMIES.

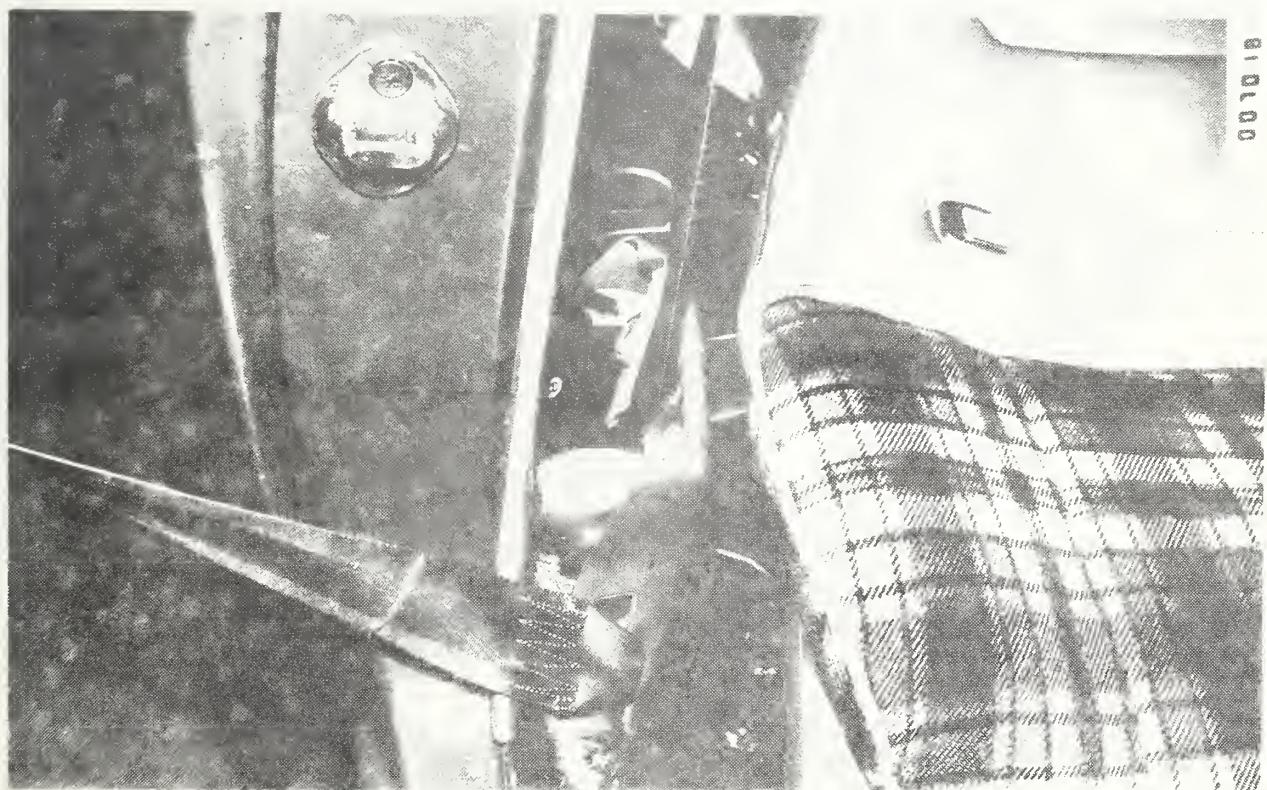
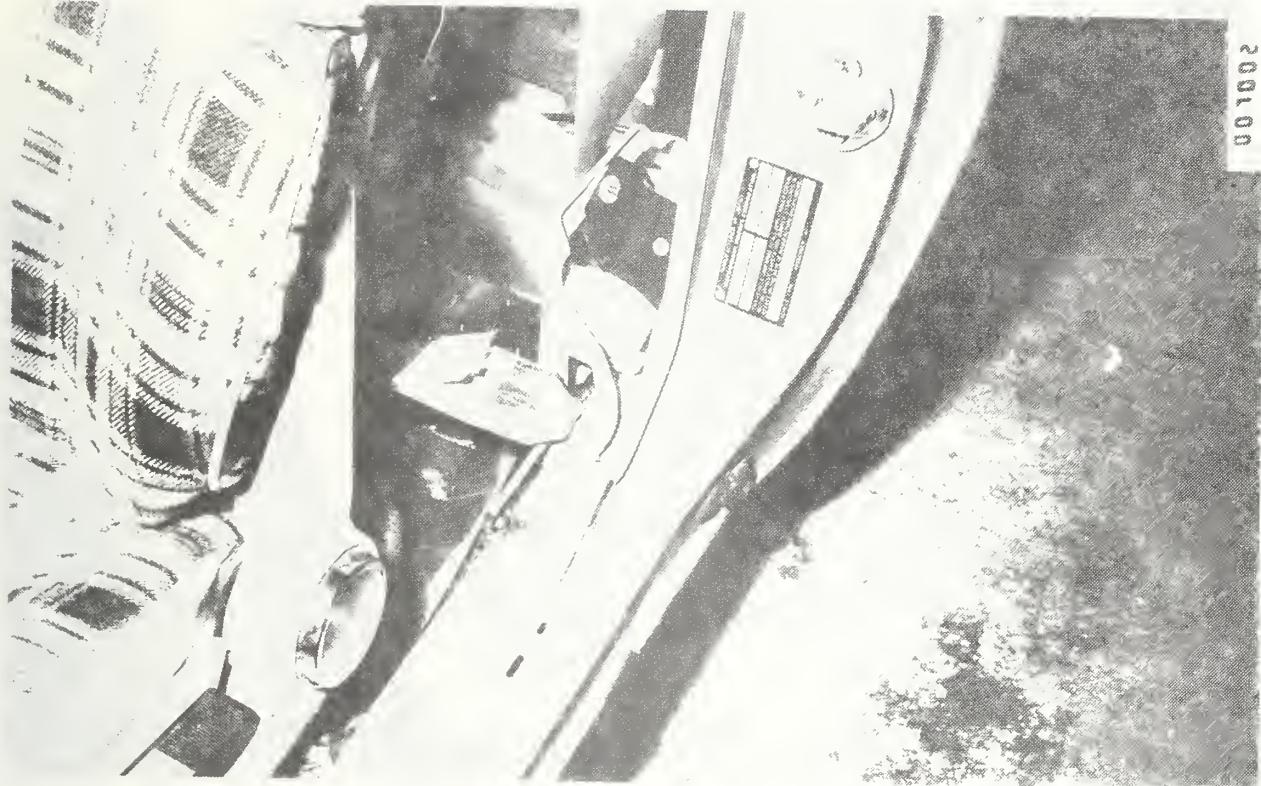


FIGURE C-8. POST-TEST VIEW OF DODGE CHALLENGER RESTRAINT SYSTEM ANCHORAGES.

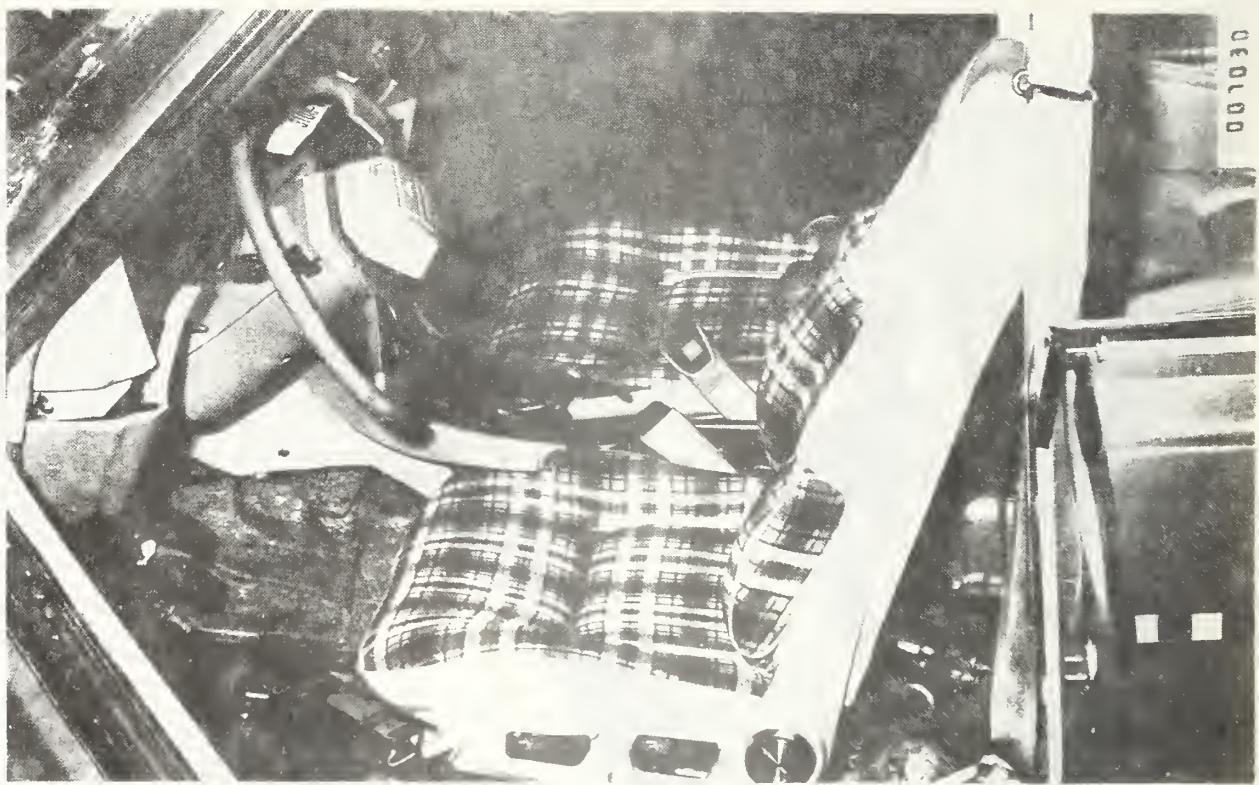


FIGURE C-9. POST-TEST SIDE VIEW OF DODGE CHALLENGER OCCUPANT COMPARTMENT.

APPENDIX D
PRE-TEST ACCEPTANCE CERTIFICATE AND
VEHICLE INFORMATION DOCUMENTATION

TEST ACCEPTANCE CERTIFICATE

Date: 9/10/80

Test Number: 3108-1

Vehicle Number: Minicars RSV M5-11 & 1979 Dodge Challenger

Test Description: Car-to-Car Frontal Impact

The following items have been inspected and found acceptable for running the vehicle test:

	<u>Minicars</u>	<u>Dynamic Science</u>	<u>NHTSA</u>
Dummy Calibration:	<u>N/A</u>	<u>RCB</u>	<u>FAD</u>
RSV Ignition "ON"	<u>TZ</u>	<u>RCB</u>	<u>N/A</u>
Dummy Location:	<u>TZ</u>	<u>RCB**</u>	<u>FAD</u>
Vehicle Inspection	<u>N/A</u>	<u>RCB**</u>	<u>FAD</u>
Dummy Instrumentation:	<u>N/A</u>	<u>RCB</u>	<u>FAD</u>
Vehicle Preparation:	<u>TZ*</u>	<u>RCB**</u>	<u>FAD</u>
Test Conditions (Speed & Vehicle Wts)	<u>TZ</u>	<u>RCB</u>	<u>FAD</u>
Vehicle Instrumentation:	<u>N/A</u>	<u>RCB</u>	<u>FAD</u>
Bumper Match of Vehicles	<u>LH</u>	<u>RCB</u>	<u>FAD</u>
Restraint System:	<u>TZ</u>	<u>RCB**</u>	<u>FAD</u>
Air Bag Monitor Circuit	<u>LH</u>	<u>RCB</u>	<u>FAD</u>
Test Site:	<u>TZ</u>	<u>RCB</u>	<u>FAD</u>
RSV Camera Mounts:	<u>TZ</u>	<u>RCB</u>	<u>FAD</u>

The following items have been noted and may have detrimental effects on the test results:

<u>Item Description</u>	<u>Action Taken</u>
1. Height from ground to bottom of RSV Front Rubrics is 15.85 inches.	None
2. Height from ground to top of Dodge Challenger Bumper is 21.8 inches	None

Minicars Representative: Ted Zinke, Larry Howes

NHTSA Representative: Francis DiLorenzo

DSI Representative: R. C. Baczyński

*The following sections of Minicars Report No. 5010 FI for the RSV are approved for tests: Section 2.6 through 2.16.

**In addition to the test plan prepared by Dynamic Science, Dynamic Science personnel complied with Section 2.2 and 3.0 of Minicars Report 5010 FI and Sections 2.2 through 2.5 of Minicars Report 5010 SI.

TABLE D-1. VEHICLE INFORMATION

	Vehicle 1	Vehicle 2
VIN No:	MIRS3SSH9M0M5011	2H29K95311382
Make:	Minicars	Dodge
Model:	RSV	Challenger
Year:	1980	1979
Engine Type:	1978 Honda CVCC 4 CYL In-Line OHC - Transv. Rear Mtd	Front Mounted 4 CYL In-Line OHC
Engine Displacement:	1600 CC	1600 CC
Transmission Type:	1978 Honda 5 Speed Manual	5 Speed Manual
Body Type:	2 Door Sedan	2 Door Coupe
Wheelbase:	104 Inches	99.2 Inches
Width:	71 Inches	63.7 Inches
Steering Column Attachment:	Modified Shear Capsule	Adjustable - up/ down no shear capsule
Steering Column Collapse Mechanism:	Embedded Ball	Telescope - up high '
Restraint System Type:	3 Pt belts, F&R, Air Bags Front	3 Pt belts "D" Ring, ELR
Knee Restraint:	Special Knee Bars	None - Dash
Describe Vehicle Modifications:	Ground-up Research Safety Vehicle	None

TABLE D-2. INCOMING VEHICLE INSPECTION.

Contractor: DYNAMIC SCIENCE, INC.

Contract No.: DOT-HS-8-01942

VIN No.: M5-11

Make: Minicars

NHTSA No.: R&D (D.S.No.1101)

Year: 1980 Color: Silver

Model: RSV 2-Door Sedan

Auto Trans: yes no

Pwr Steering: yes no

yes no

Seats: Bench:
(front)

Pwr Brakes: yes no

Auto Speed Cont: yes no

Bucket: X

Pwr Seats: yes no

Anti Skid Brake: yes no

Split
Bench:

Pwr Windows: yes no

Air Conditioning: yes no

Split
Back
Bench:

Tinted Glass: yes no

Rear Window Def.: yes no

Radio: yes no

Brakes: drum: _____ disc: F&R

Clock: yes no

200/65

Tire Size: HR 370 Ply Rating Runflat Mfg. & Line: Dunlop Denovo 2

Total

Bias Ply: _____ Belted: _____ Radial: X /Eng.HP: _____ Cylinders: 4 Displ: 1600 cc.

Trans, # Fwd. Speeds: 5 Shipping Weight: _____ Odometer: 280.4

Dealer (name, address, and phone number)

Minicars

Remarks (list additional accessories not listed above)

Date of Manufacture Unknown

Date Received 8/21/80

Tilting Steering Wheel: Yes No

Telescoping Steering Wheel Yes No

Fuel Capacity: _____ Gallons

(from owner's manual)

"Space Saver" Spare tire Yes No

(Government Use Only)

NHTSA Req. No.: _____ Purchase Team: _____

Date Purchased: _____ Purchase Order No.: _____ Purchase Price: _____

O.S.E.-NHTSA No.: _____ Wholesale Price: _____ Suggested Est. Price: _____

Photos: yes no Tax Exemption Cert. No.: _____ Amount of Tax: _____

Wholesale Invoice: yes no Consumer Info: yes no Warranty Card: yes no

Cert. of Origin: yes no Date Mfg: _____ Assy. Plant: _____

DOT License: _____ Accident Rpt. Kit: yes no Belt Decal: yes no

TABLE D-3. INCOMING VEHICLE INSPECTION.

Contractor: <u>DYNAMIC SCIENCE, INC.</u>	Contract No.: <u>DOT-HS-8-01942</u>	
VIN No.: <u>2H29K95311382</u>	Make: <u>Dodge</u>	
NHTSA No.: <u>R&D (D.S. No.1093)</u>		
Year: <u>1979</u>	Color: <u>Silver/Red</u>	Model: <u>Challenger</u>
Auto Trans: yes <input type="checkbox"/> no <input type="checkbox"/>	Pwr Steering: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	Seats: Bench: _____ (front) _____
Pwr Brakes: yes <input checked="" type="checkbox"/> no <input type="checkbox"/>	Auto Speed Cont: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	Bucket: <input checked="" type="checkbox"/>
Pwr Seats: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	Anti Skid Brake: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	Split Bench: _____
Pwr Windows: yes <input type="checkbox"/> no <input checked="" type="checkbox"/>	Air Conditioning: yes <input checked="" type="checkbox"/> no <input type="checkbox"/>	Split Back Bench: _____
Tinted Glass: yes <input checked="" type="checkbox"/> no <input type="checkbox"/>	Rear Window Def.: yes <input checked="" type="checkbox"/> no <input type="checkbox"/>	Back Bench: _____
Radio: yes <input checked="" type="checkbox"/> no <input type="checkbox"/>	Brakes: drum: <u>R</u> disc: <u>F</u>	
Clock: <u>195/70 R14</u>		
Tire Size: <u>R14</u>	Ply Rating: <u>4</u>	Mfg. & Line: <u>B.F. Goodrich</u>
Bias Ply: _____	Belted: _____	Steel Radial: <input checked="" type="checkbox"/> /Eng.HP: _____ Cylinders: <u>4</u> Total Displ: <u>1600 cc.</u>
Trans. # Fwd. Speeds: <u>5</u>	Shipping Weight: _____	Odometer: <u>348.1</u>

Dealer (name, address, and phone number)

Riverside Chrysler Plymouth
7979 Auto Drive
Riverside, California

Remarks (list additional accessories not listed above)

Date of Manufacture 9/78

Date Received 7/28/80

Tilting Steering Wheel: Yes No

Telescoping Steering Wheel Yes No

Fuel Capacity: _____ Gallons

(from owner's manual)

"Space Saver" Spare tire Yes No

(Government Use Only)

NHTSA Req. No.: _____ Purchase Team: _____

Date Purchased: _____ Purchase Order No.: _____ Purchase Price: _____

O.S.E.-NHTSA No.: _____ Wholesale Price: _____ Suggested Est. Price: _____

Photos: yes no Tax Exemption Cert. No.: _____ Amount of Tax: _____

Wholesale Invoice: yes no Consumer Info: yes no Warranty Card: yes no

Cert. of Origin: yes no Date Mfg: _____ Assy. Plant: _____

DOT License: _____ Accident Rpt. Kit: yes no Belt Decal: yes no

APPENDIX E
PRE- AND POST-TEST DUMMY CALIBRATIONS

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A 0 8 Driver - RSV M5-11

Laboratory Technician: Rex Bishop

Inst. Engineer: David Hyatt

	Pre-test Calibration	Post-test Calibration*
Date of Dummy Calibration	6/20/80	9/18/80
Calibration Sequential Number for Dummy	32	33
Temperature in Lab. (Spec. = 66 to 78 °F)	73	72
Relative Humidity in Lab. (Spec. = 10 to 70%)		48

Test Parameter	Specification			
1. Head Drop Test:				
a. Peak Resultant Accel	210 - 260G	228.06	224.62	
b. Peak Lateral Accel	\leq 10G	6.26	3.10	
c. Time above 100G (Resultant)	0.9 - 1.5 ms	1.45	1.25	
2. Neck Bending Test:				
a. Pendulum Speed	21.5 - 25.5 fps	21.87	22.45	
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	23.70	22.71	
c. Peak Resultant Head Acceleration	26G Maximum	23.76	20.90	
d. Pendulum Decel ($t_2 - t_1$)	\leq 3 ms	2.00	2.00	
e. Pendulum Decel (t_3-t_2)	25 - 30 ms	26.50	26.00	
f. Pendulum Decel (t_4-t_3)	\leq 10 ms	3.25	6.00	
g. Pendulum Direction Reversal Time		-	-	
h. Maximum Head Rota- tion	63 to 73°	72.67	66.65	
i. Chordal Displacement:				

Head Rotation Angle

0°	Time	-2.0 -+2 ms	0	0
	Displ	-0.5 - 0.5 in.	0	0
30°	Time	25.6 - 34.4 ms	31.50	27.50
	Displ	2.1 - 3.1 in.	2.30	2.43
60°	Time	40.3 - 51.7 ms	47.75	45.00
	Displ	4.3 - 5.3 in.	4.45	4.40
Maximum (73°)	Time	53.2 - 66.8 ms	65.25	60.00
	Displ	5.0 - 6.0 in.	5.27	4.97

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A 0 8

Test Parameter	Specification	Pre-test Calibration	Post-test Calibration
2. Neck Bending Test: (Continued)			
Head Rotation Angle			
60°	Time 67.0 - 83.0 ms	80.75	73.00
	Displ 4.3 - 5.3 in.	4.45	4.24
30°	Time 85.4 - 104.6 ms	98.75	89.00
	Displ 2.1 - 3.1 in.	2.29	2.20
0°	Time 101.0 - 123.0 ms	112.25	102.50
	Displ -0.5 - 0.5 in.	0.0	0.00
3. Abdominal Compression Test: (Preload = 10 pounds)			
a. Force at 0.5 in.	14 - 26 lb	18.52	18.50
b. Force at 0.75 in.	27 - 40 lb	28.36	28.90
c. Force at 1.0 in.	40 - 53 lb	42.25	42.80
d. Force at 1.3 in.	63 - 78 lb	63.67	64.80
4. Lumbar Flexion Test:			
a. Force at 20°	22 - 34 lb	27.78	26.60
b. Force at 30°	34 - 46 lb	43.99	42.80
c. Force at 40°	46 - 58 lb	46.88	48.00
d. Return Angle	12° Maximum	3.60	1.80
5. Chest Impact Tests:			
a. High Speed			
1) Probe Speed	21.78-22.22 fps	22.13	22.04
2) Peak Deflection	1.7 in. Maximum	1.549	1.539
3) Peak Resistive Force	2250 lb Maximum	1769.15	2066.39
4) Internal Hysteresis	50 - 70%	60.60	63.40
a. Low Speed			
1) Probe Speed	13.86-14.14 fps	13.92	13.98
2) Peak Deflection	1.1 in. Maximum	1.032	1.072
3) Peak Resistive Force	1450 lb Maximum	1089.61	1333.99
4) Internal Hysteresis	50 - 70%	67.40	61.60

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A 0 8

Test Parameter	Specification	Pre-test	Post-test
		Calibration	Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.84	6.87
2) Maximum Force	1850 - 2500 lb	2136.96	2136.55
3) Time >1000 lb	1.7 ms Minimum	1.95	1.90
a. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.84	6.86
2) Maximum Force	1850 - 2500 lb	2389.14	2270.66
3) Time >1000 lb	1.7 ms Minimum	1.90	2.00

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A 0 9 Driver - RSV M5-11

Laboratory Technician: Rex Bishop

Inst. Engineer: David Hyatt

	Pre-test Calibration	Post-test Calibration*
Date of Dummy Calibration	6/20/80	9/18/80
Calibration Sequential Number for Dummy	30	31
Temperature in Lab. (Spec. = 66 to 78 °F)	73	72
Relative Humidity in Lab. (Spec. = 10 to 70%)		48

Test Parameter	Specification			
1. Head Drop Test:				
a. Peak Resultant Accel	210 - 260G	251.10	-	230.20
b. Peak Lateral Accel	≤ 10G	8.34	-	7.70
c. Time above 100G (Resultant)	0.9 - 1.5 ms	1.25	-	1.20
2. Neck Bending Test:				
a. Pendulum Speed	21.5 - 25.5 fps	22.21	22.40	
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	22.77	22.40	
c. Peak Resultant Head Acceleration	26G Maximum	21.03	20.00	
d. Pendulum Decel ($t_2 - t_1$)	≤ 3 ms	2.00	2.50	
e. Pendulum Decel (t_3-t_2)	25 - 30 ms	28.50	28.00	
f. Pendulum Decel (t_4-t_3)	≤ 10 ms	3.75	4.00	
g. Pendulum Direction Reversal Time		-	-	
h. Maximum Head Rota- tion	63 to 73°	72.77	71.84	
i. Chordal Displacement:				

Head Rotation Angle

0°	Time	-2 - 2 ms	0	0
	Displ	-0.5 - 0.5 in.	0	0
30°	Time	25.6 - 34.4 ms	30.25	26.70
	Displ	2.1 - 3.1 in.	2.31	2.50
60°	Time	40.3 - 51.7 ms	47.75	43.70
	Displ	4.3 - 5.3 in.	4.44	4.42
Maximum (73°)	Time	53.2 - 66.8 ms	63.00	60.00
	Displ	5.0 - 6.0 in.	5.29	5.06

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A 0 9

Test Parameter	Specification		Pre-test	Post-test
			Calibration	Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	81.50	76.30
	Displ	4.3 - 5.3 in.	4.45	4.60
30°	Time	85.4 - 104.6 ms	98.00	90.10
	Displ	2.1 - 3.1 in.	2.30	2.30
0°	Time	101.0 - 123.0 ms	113.75	104.00
	Displ	-0.5 - 0.5 in.	0.0	0.00
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	20.26	18.52
b. Force at 0.75 in.		27 - 40 lb	31.26	28.94
c. Force at 1.0 in.		40 - 53 lb	49.20	42.83
d. Force at 1.3 in.		63 - 78 lb	76.40	67.14
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	26.62	28.40
b. Force at 30°		34 - 46 lb	39.94	41.70
c. Force at 40°		46 - 58 lb	48.62	50.40
d. Return Angle		12° Maximum	7.61	3.10
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	21.97	22.01
2) Peak Deflection		1.7 in. Maximum	1.644	1.495
3) Peak Resistive Force		2250 lb Maximum	1581.69	2014.08
4) Internal Hysteresis		50 - 70%	59.40	65.87
a. Low Speed				
1) Probe Speed		13.86-14.14 fps	13.95	13.99
2) Peak Deflection		1.1 in. Maximum	1.097	0.954
3) Peak Resistive Force		1450 lb Maximum	1031.03	1347.08
4) Internal Hysteresis		50 - 70%	59.10	62.30

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A 0 9

<u>Test Parameter</u>	<u>Specification</u>	<u>Pre-test</u>	<u>Post-test</u>
		Calibration	Calibration
6. Knee Impact Tests:		30	31
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.83	6.86
2) Maximum Force	1850 - 2500 lb	1869.84	2091.60
3) Time >1000 lb	1.7 ms Minimum	2.15	1.80
a. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.97	6.86
2) Maximum Force	1850 - 2500 lb	2043.34	1853.60
3) Time >1000 lb	1.7 ms Minimum	2.10	2.00

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: 8 1 4 Driver - Dodge Challenger

Laboratory Technician: Rex Bishop

Inst. Engineer: Vinit Agnihotri

	Pre-test Calibration	Post-test Calibration*
Date of Dummy Calibration	8/06/80	9/12/80
Calibration Sequential Number for Dummy	1	2
Temperature in Lab. (Spec. = 66 to 78 °F)	75	72
Relative Humidity in Lab. (Spec. = 10 to 70%)	48	50

Test Parameter	Specification		
1. Head Drop Test:			
a. Peak Resultant Accel	210 - 260G	213.40	238.20
b. Peak Lateral Accel	\leq 10G	7.70	5.40
c. Time above 100G (Resultant)	0.9 - 1.5 ms	1.25	1.25
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	21.91	21.90
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	21.40	21.80
c. Peak Resultant Head Acceleration	26G Maximum	21.30	20.70
d. Pendulum Decel ($t_2 - t_1$)	\leq 3 ms	2.50	2.00
e. Pendulum Decel ($t_3 - t_2$)	25 - 30 ms	25.00	26.00
f. Pendulum Decel ($t_4 - t_3$)	\leq 10 ms	6.50	6.00
g. Pendulum Direction Reversal Time		-	-
h. Maximum Head Rota- tion	63 to 73°	71.80	71.60
i. Chordal Displacement:			

Head Rotation Angle

0°	Time	-2 - 2 ms	0	0
	Displ	-0.5 - 0.5 in.	0	0
30°	Time	25.6 - 34.4 ms	30.00	28.00
	Displ	2.1 - 3.1 in.	2.42	2.30
60°	Time	40.3 - 51.7 ms	48.00	45.00
	Displ	4.3 - 5.3 in.	4.67	4.45
Maximum (73°)	Time	53.2 - 66.8 ms	66.00	60.00
	Displ	5.0 - 6.0 in.	5.52	5.17

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: 8 1 4

Test Parameter	Specification	Pre-test	Post-test
		Calibration	Calibration
2. Neck Bending Test: (Continued)			
Head Rotation Angle			
60°	Time 67.0 - 83.0 ms Displ 4.3 - 5.3 in.	82.00	78.0 4.43
30°	Time 85.4 - 104.6 ms Displ 2.1 - 3.1 in.	102.00	95.0 2.29
0°	Time 101.0 - 123.0 ms Displ -0.5 - 0.5 in.	118.00	110.00 0.00
3. Abdominal Compression Test: (Preload = 10 pounds)			
a. Force at 0.5 in.	14 - 26 lb	20.80	22.60
b. Force at 0.75 in.	27 - 40 lb	34.20	40.00
c. Force at 1.0 in.	40 - 53 lb	52.00	61.00
d. Force at 1.3 in.	63 - 78 lb	78.10	93.00
4. Lumbar Flexion Test:			
a. Force at 20°	22 - 34 lb	28.90	28.90
b. Force at 30°	34 - 46 lb	43.40	38.80
c. Force at 40°	46 - 58 lb	50.90	46.30
d. Return Angle	12° Maximum	7.00	5.00
5. Chest Impact Tests:			
a. High Speed			
1) Probe Speed	21.78-22.22 fps	22.00	21.96
2) Peak Deflection	1.7 in. Maximum	1.645	1.744
3) Peak Resistive Force	2250 lb Maximum	1961.80	1909.50
4) Internal Hysteresis	50 - 70%	59.90	56.50
a. Low Speed			
1) Probe Speed	13.86-14.14 fps	13.96	13.97
2) Peak Deflection	1.1 in. Maximum	1.025	1.185
3) Peak Resistive Force	1450 lb Maximum	1307.80	1307.80
4) Internal Hysteresis	50 - 70%	60.65	60.30

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: 8 1 4

Test Parameter	Specification	Pre-test	Post-test	
		Calibration	Calibration	
6. Knee Impact Tests:				
a. Right Side				
1) Probe Speed	6.76 - 7.04 fps	6.84	6.80	
2) Maximum Force	1850 - 2500 lb	2230.80	2284.80	
3) Time >1000 lb	1.7 ms Minimum	1.75	1.75	
a. Left Side				
1) Probe Speed	6.76 - 7.04 fps	6.84	6.84	
2) Maximum Force	1850 - 2500 lb	2352.70	2234.80	
3) Time >1000 lb	1.7 ms Minimum	1.75	1.75	

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A 0 4 Passenger - Dodge Challenger

Laboratory Technician: Rex Bishop

Inst. Engineer: David Hyatt

	Pre-test Calibration	Post-test Calibration*
Date of Dummy Calibration	6/05/80	9/12/80
Calibration Sequential Number for Dummy	17	18
Temperature in Lab. (Spec. = 66 to 78 °F)	72	76
Relative Humidity in Lab. (Spec. = 10 to 70%)		52

Test Parameter	Specification			
1. Head Drop Test:				
a. Peak Resultant Accel	210 - 260G	257.71	268.50	
b. Peak Lateral Accel	≤ 10G	3.96	3.10	
c. Time above 100G (Resultant)	0.9 - 1.5 ms	1.50	1.00	
2. Neck Bending Test:				
a. Pendulum Speed	21.5 - 25.5 fps	21.90	21.65	
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	23.31	22.40	
c. Peak Resultant Head Acceleration	26G Maximum	20.12	21.30	
d. Pendulum Decel ($t_2 - t_1$)	≤ 3 ms	2.10	2.00	
e. Pendulum Decel (t_3-t_2)	25 - 30 ms	29.60	26.00	
f. Pendulum Decel (t_4-t_3)	≤ 10 ms	3.20	5.00	
g. Pendulum Direction Reversal Time		-	-	
h. Maximum Head Rota- tion	63 to 73°	72.14	70.00	
i. Chordal Displacement:				

Head Rotation Angle

0°	Time	-2 - 2 ms	0	0
	Displ	-0.5 - 0.5 in.	0	0
30°	Time	25.6 - 34.4 ms	30.75	29.00
	Displ	2.1 - 3.1 in.	2.38	2.46
60°	Time	40.3 - 51.7 ms	49.75	45.00
	Displ	4.3 - 5.3 in.	4.58	4.69
Maximum (73°)	Time	53.2 - 66.8 ms	63.00	61.00
	Displ	5.0 - 6.0 in.	5.40	5.43

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A 0 4

Test Parameter	Specification	Pre-test	Post-test
		Calibration	Calibration
2. Neck Bending Test: (Continued)			
	Head Rotation Angle		
60°	Time 67.0 - 83.0 ms	80.75	74.00
	Displ 4.3 - 5.3 in.	4.57	4.68
30°	Time 85.4 - 104.6 ms	100.75	91.00
	Displ 2.1 - 3.1 in.	2.36	2.44
0°	Time 101.0 - 123.0 ms	109.50	108.00
	Displ -0.5 - 0.5 in.	0.00	0.00
3. Abdominal Compression Test: (Preload = 10 pounds)			
a. Force at 0.5 in.	14 - 26 lb	21.99	22.60
b. Force at 0.75 in.	27 - 40 lb	34.73	35.90
c. Force at 1.0 in.	40 - 53 lb	50.93	52.10
d. Force at 1.3 in.	63 - 78 lb	74.09	73.00
4. Lumbar Flexion Test:			
a. Force at 20°	22 - 34 lb	28.94	27.80
b. Force at 30°	34 - 46 lb	42.83	38.20
c. Force at 40°	46 - 58 lb	51.51	40.50
d. Return Angle	12° Maximum	6.70	6.10
5. Chest Impact Tests:			
a. High Speed			
1) Probe Speed	21.78-22.22 fps	22.03	21.91
2) Peak Deflection	1.7 in. Maximum	1.663	1.603
3) Peak Resistive Force	2250 lb Maximum	1546.55	1883.30
4) Internal Hysteresis	50 - 70%	64.8	63.80
a. Low Speed			
1) Probe Speed	13.86-14.14 fps	13.88	13.92
2) Peak Deflection	1.1 in. Maximum	1.034	1.092
3) Peak Resistive Force	1450 lb Maximum	1066.18	1307.80
4) Internal Hysteresis	50 - 70%	64.00	63.13

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A 0 4

<u>Test Parameter</u>	<u>Specification</u>	<u>Pre-test</u>	<u>Post-test</u>	
		<u>Calibration</u>	<u>Calibration</u>	
6. Knee Impact Tests:				
a. Right Side				
1) Probe Speed	6.76 - 7.04 fps	6.85	6.84	
2) Maximum Force	1850 - 2500 lb	2136.96	1877.90	
3) Time >1000 lb	1.7 ms Minimum	1.50	2.00	
a. Left Side				
1) Probe Speed	6.76 - 7.04 fps	6.86	6.84	
2) Maximum Force	1850 - 2500 lb	1917.60	1910.90	
3) Time >1000 lb	1.7 ms Minimum	1.85	1.75	

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